# plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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A Precision Instrument for Testing the Thickness of Electoplates by Electrolytic Stripping Method

Boston Branch's Minute Men Readying Historic Boston for AES's Convention Advent

PLATING MAGAZINE

AUDITED PAID CIRCULATION ABC

NOVEMBER - 196

University Microfilms
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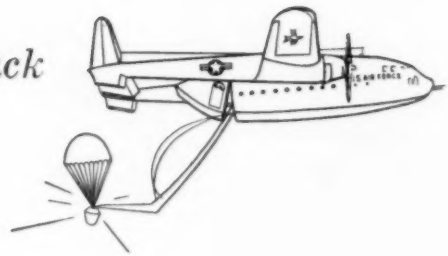
*finding the golden needle in the haystack*



(Top right) *sketch illustrates mid-air catch of returning Discoverer XIV nose cone snagged by an airplane-towed "skyhook."* (left) *A captured practice capsule is slowly reeled towards the rear opening of airborne C-119 Recovery Plane.*

# NOSE CONES PLATED WITH SEL-REX BRIGHT GOLD* RECOVERED FROM SPACE ORBITS!

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(Above) *President Eisenhower holds American flag which was in recovered capsule during its flight through space. Capsule shown was electroplated with patented Sel-Rex Bright Gold Process. With the President are General Thomas D. White, Air Force chief* (center) *and Col. Charles G. Mathison, who directed the "capsule chase."*

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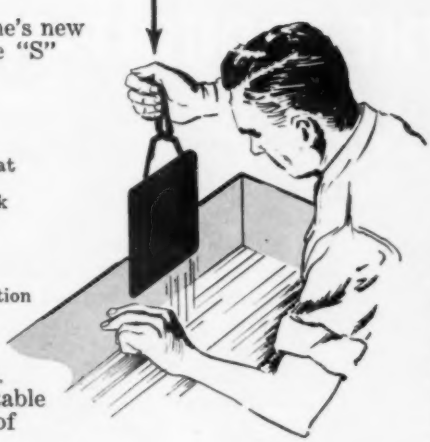

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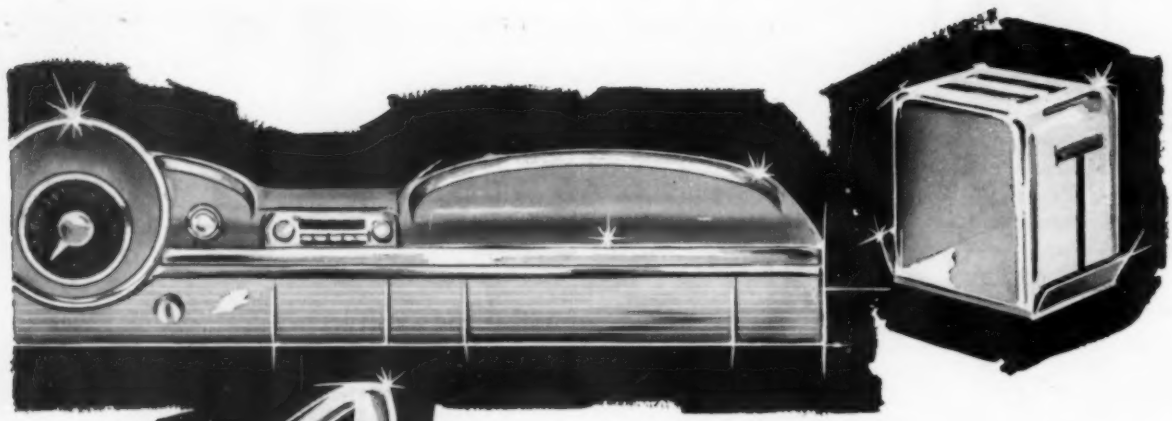

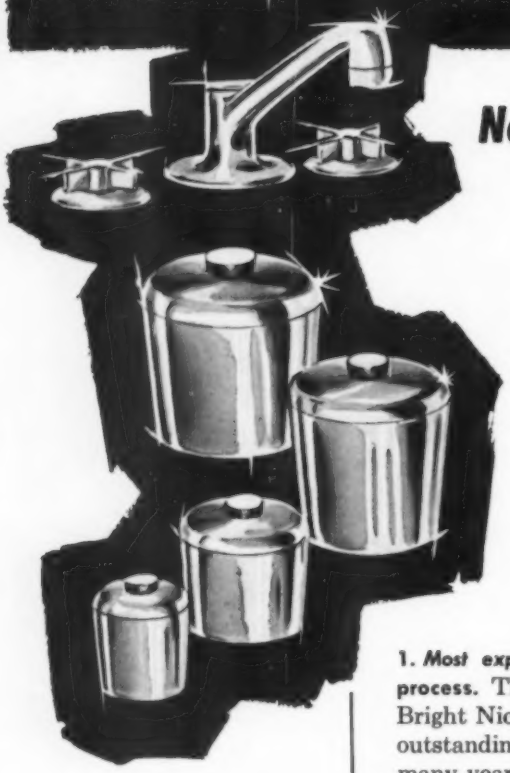

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# EDITORIAL

## BRANCH MEMBERS' EDUCATION AND YOUR BRANCH

THE MONTHLY Branch Educational Session is one of the American Electroplaters' Society's (AES) most effective media at Branch level for advancing the AES member's knowledge of the arts and sciences of electroplating, metal finishing, organic coating and allied arts. Consequently, in each of AES's 59 Branches in the United States, Canada and Australia, it is of the essence not only that these monthly Branch educational assemblies be well-programmed but also that they be well-attended.

To this end, this paragraph in the Editorial by AES First Vice President Chester G. Borlet that appeared in October 1960 PLATING MAGAZINE is especially important, and certainly warrants this reprinting here:

> One large and burgeoning AES Branch's use of that statement, for example, is worthy of comment here. That Branch has vested the responsibility of providing its members with top-grade education at monthly Branch meetings by appointing a Branch Educational Chairman and two qualified assistants. It has conducted a well-planned and well-executed poll of its members to determine exactly what type of technical knowledge is needed in that particular Branch. By employing the AES Speakers List to the end of obtaining qualified speakers on those particular areas of technical interest, it hopes to offer Branch meetings wherein its members can indeed find knowledge in the areas of their personal interest.

So as to see the subject whole and understand it fully, here are the actual results of that particular Branch's poll of its members determining the technical subjects preferred for Branch concentration in that particular Branch, in the reported order of members' preference:

| Subject | Preference Votes out of 85 voting |
|---|---|
| 1. Ultrasonics | 38 |
| 2. Passivity of most metals, how to remove it, how to produce it, and testing | 36 |
| 3. Precious metal plating | 34 |
| 4. Printed circuits | 34 |
| 5. Plating on difficult metals, such as titanium, tungsten, magnesium, etc. | 33 |
| 6. Plant visitations | 32 |
| 7. Electropolishing | 32 |
| 8. Alloy plating | 32 |
| 9. Post treatments, conversion coatings, etc. | 31 |
| 10. Panel discussions | 30 |
| 11. Nickel plating | 30 |
| 12. Chromium plating | 30 |
| 13. Water and waste control | 29 |
| 14. Oxide finishes | 29 |
| 15. Anodizing | 27 |

You will serve *your* Branch effectively by conducting a similar poll periodically in *your* Branch. Any successful effort made to improve the educational qualifications of *your* Branch members will redound not only to the best interest of *your* Branch and *your* Branch members but also to the educational value of *your* Society and *your* industry.

*Frank O. Beuckman*

*Third Vice President*
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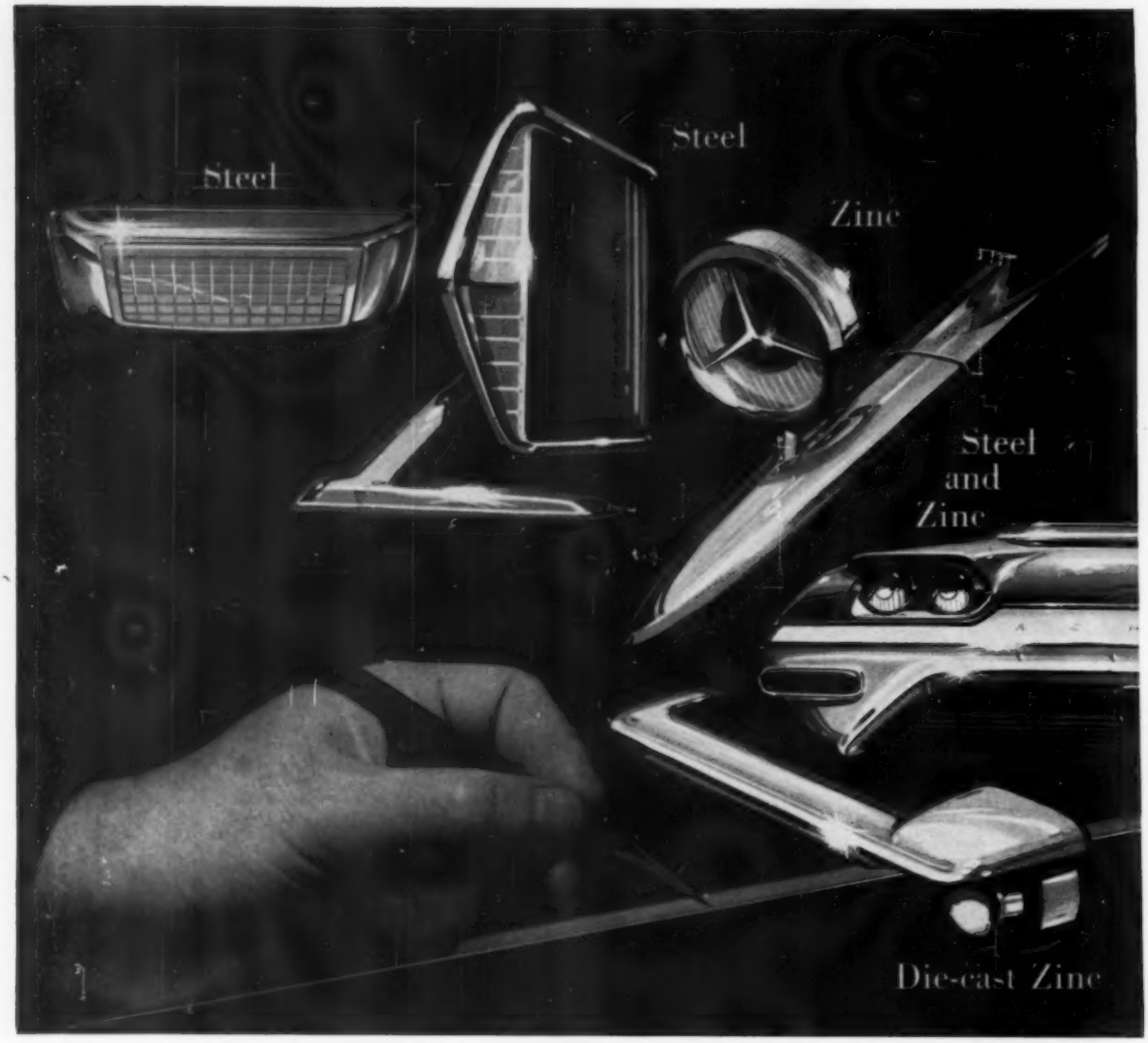


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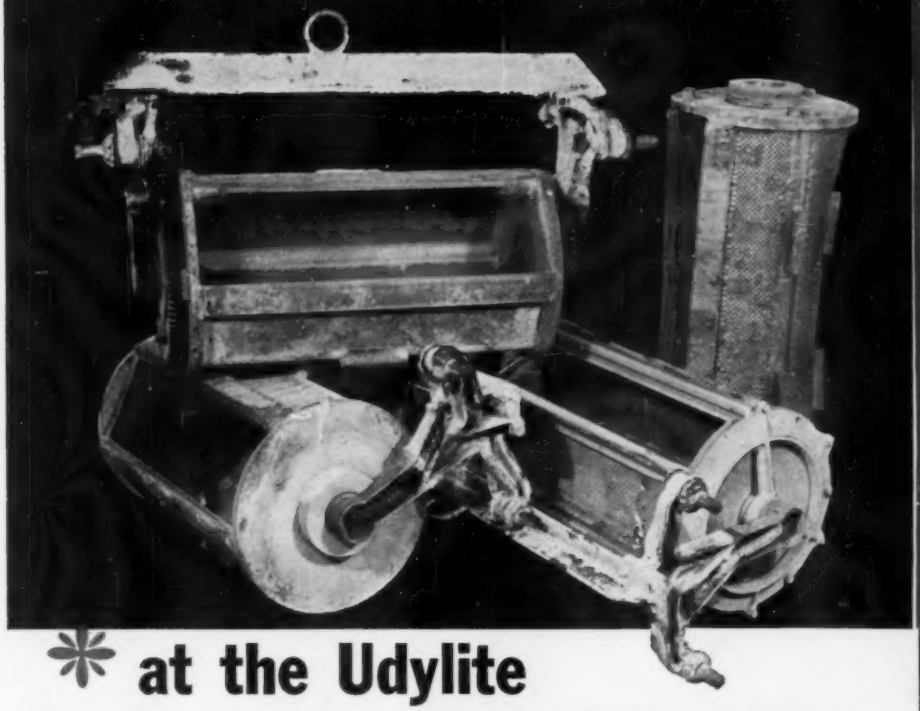

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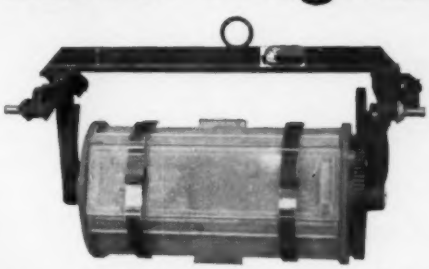

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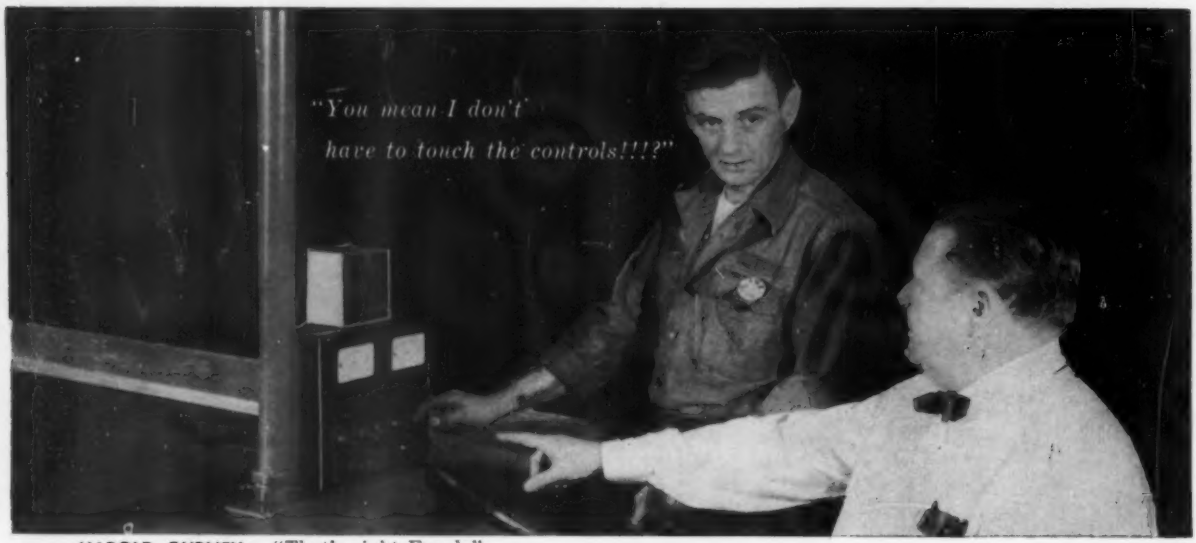


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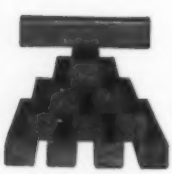

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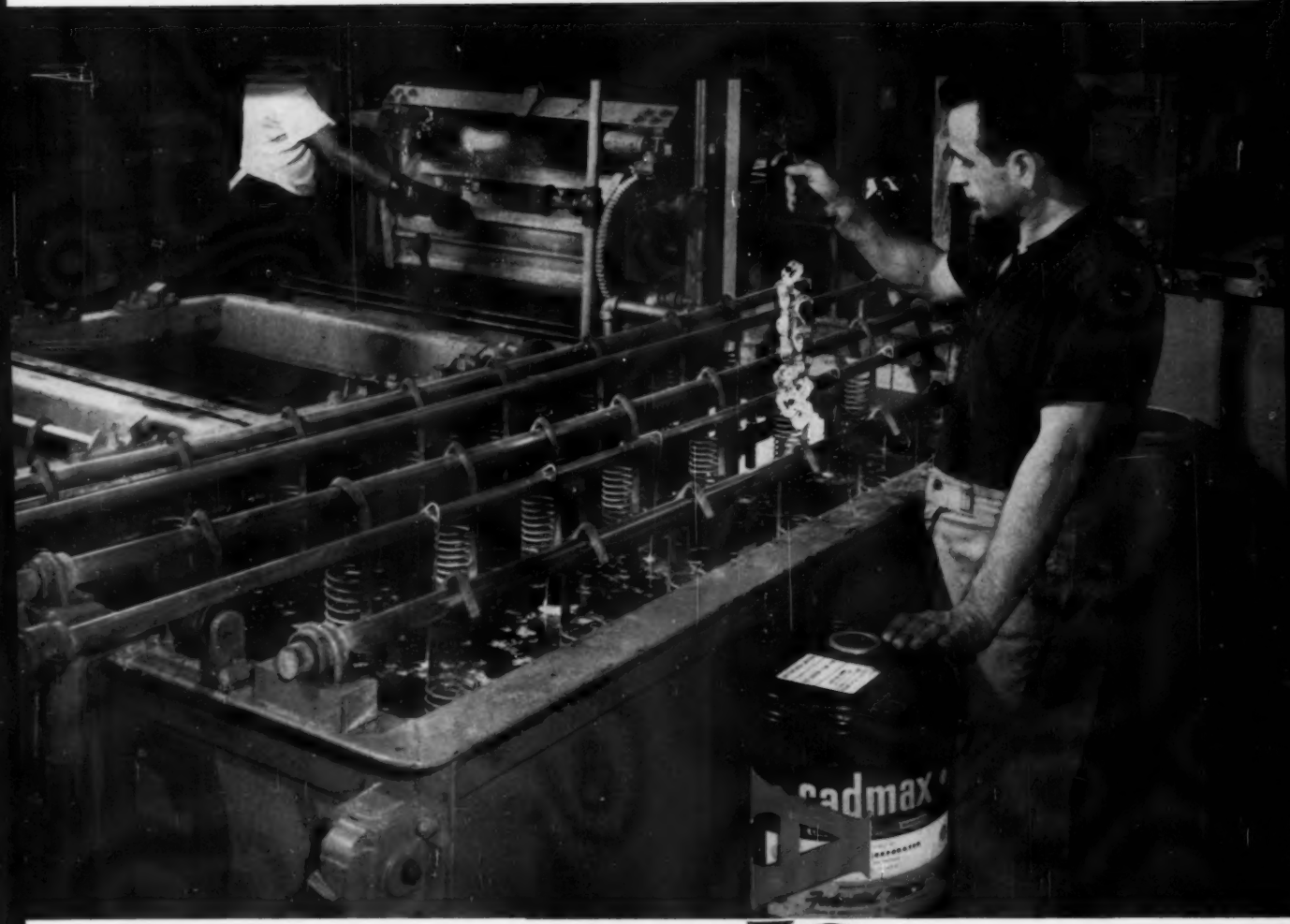


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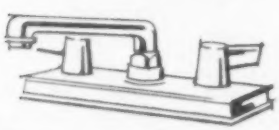

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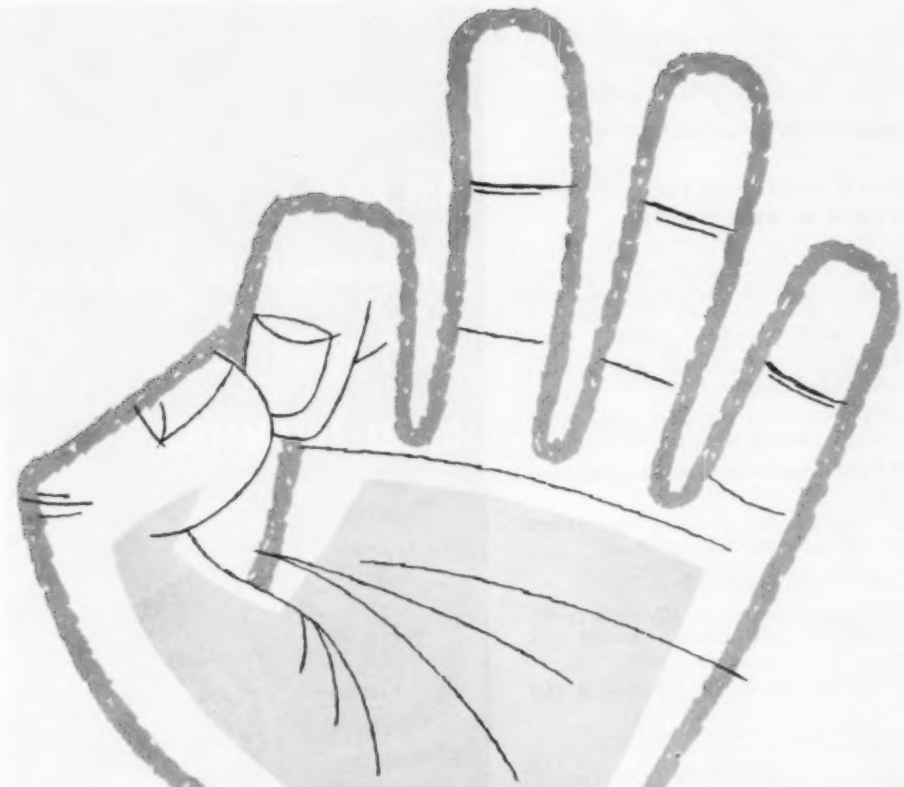

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DRAMATIC and fitting climax of its year-long FIFTIETH ANNIVERSARY observance, American Electroplaters' Society, Inc. (AES) conducted its unique Golden Jubilee Convention and Industrial Finishing Exposition, including the concurrent Fifth International Conference on Electrodeposition and Metal Finishing, in Detroit, Michigan, June 15-19, 1959.

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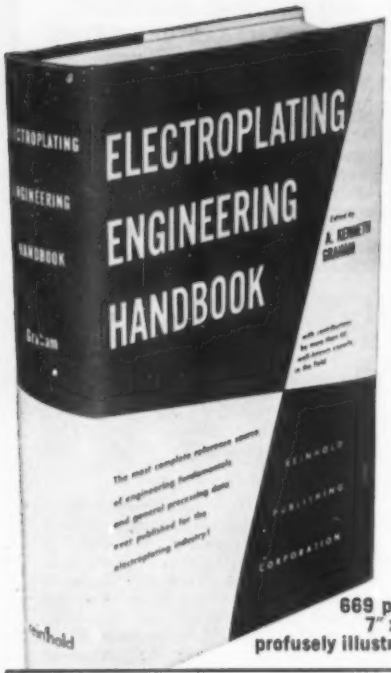
OPENING SESSION OF THE FIFTH INTERNATIONAL CONFERENCE ON ELECTRODEPOSITION AND METAL FINISHING

(1) Chairman Walter L. Pinner extending official welcome. Dr. William Blum, AES Scientific Award winner, seated. (2) Crowded auditorium at the first session. (3) Session Chairman T. P. Hoar introducing Dr. Blum, who delivered the first William Blum Lecture.

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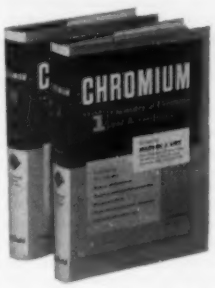


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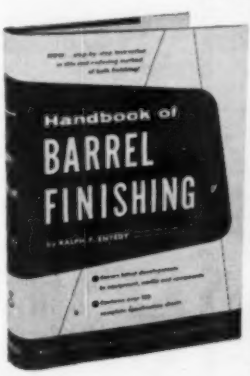


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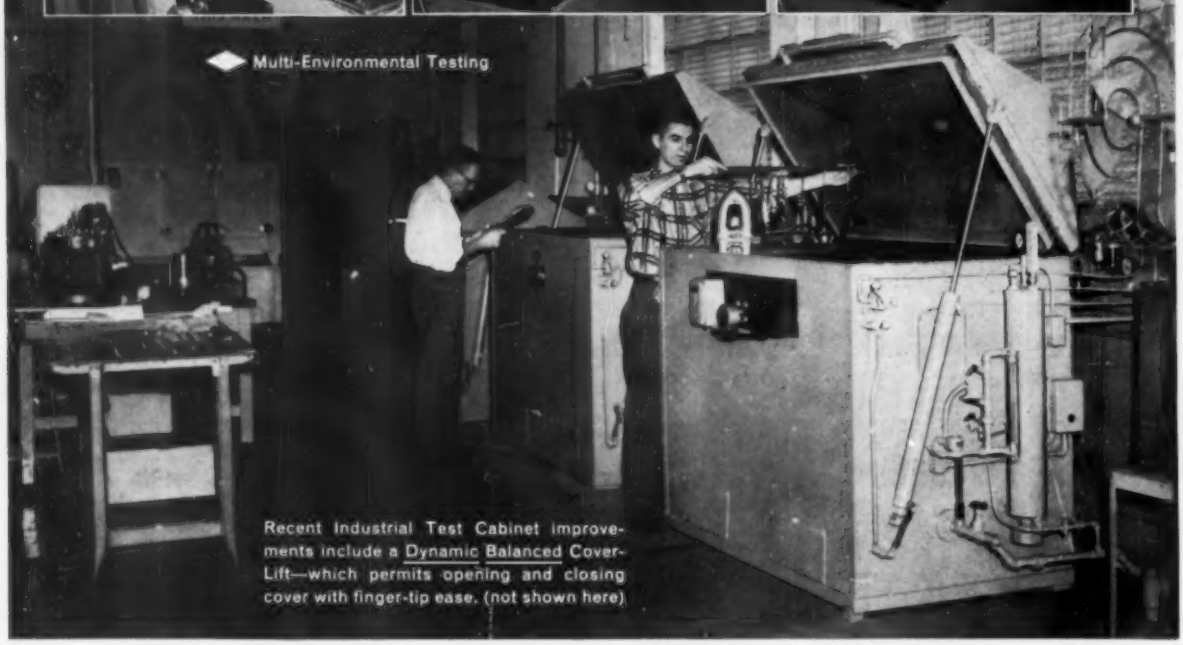

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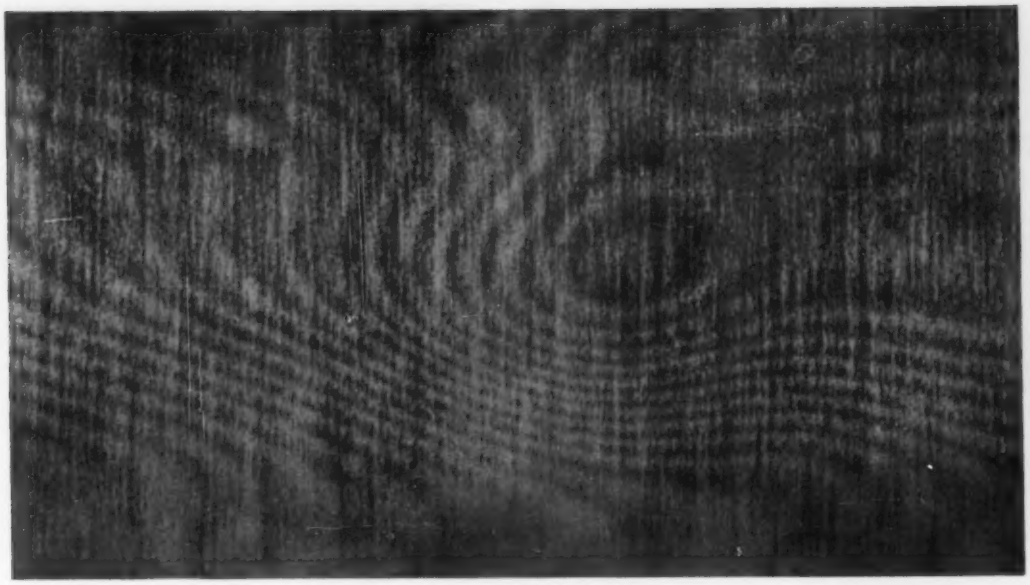

Fig. 1. Wood-grained tin plate 1½×.

# FACTORS PRODUCING TIN-PLATE WOOD GRAIN

by R. F. HIGGS and J. A. McCARTHY*


## ABSTRACT

This investigation was conducted to determine the cause of the tin-plate surface condition known as "wood grain," which is a pattern of alternate bands of bright and dull tin on finished tin plate. To date, ten distinct factors have been experimentally established that affect the formation of wood grain under certain conditions. These factors are (1) type of melting, (2) rate of melting, (3) coating thickness, (4) local variations in base-metal thickness, (5) tin concentration in the electrolyte, (6) plating-current density, (7) electrolyte temperature, (8) condition of the strip prior to plating, (9) fluxing, and (10) addition-agent activity. A theory is here proposed that the primary cause of wood grain is related to the grain size and/or the crystal structure of the tin as electrodeposited (prior to melting), and that the factors mentioned above produce wood grain because of their effect on the grain size and/or the crystal structure.


## INTRODUCTION

IN THE COMMERCIAL PRODUCTION of electrolytic tin plate in strip-plating lines, a pattern known as "wood grain" occasionally appears on the tin plate surface, Fig. 1. This pattern, which consists of alternate bands of bright and dull tin resembling the grain in cut wood, is visible only after the tin coating has been brightened by melting, which is one of the later steps in the tin-plate production process.

Although a wood-grained surface looks attractive, it is regarded as undesirable because it results in a nonuniform appearance of the product (that is, mixed wood-grained and non-wood-grained sheets).

Fortunately, wood grain does not appear frequently enough to be a serious production problem, and when it appears it

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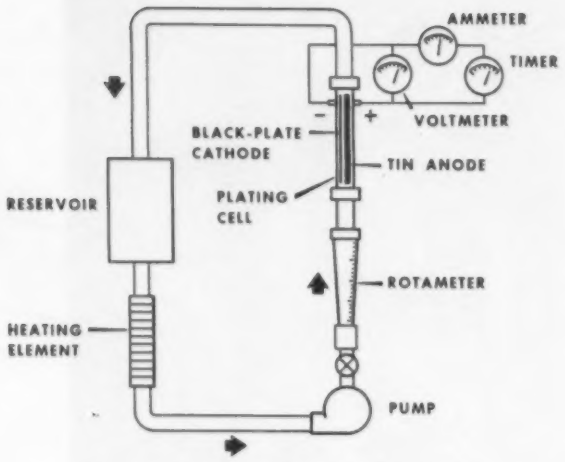


**Fig. 2.** Schematic drawing of circulation cell.

generally yields to simple remedies that have been evolved from production experience. These remedies consist of the manipulation of certain operating variables, chiefly temperature, current density, pickle polarity, or combinations thereof.

This paper notes and analyzes the result of past experiences with wood grain and describes a recent series of experiments that more sharply defines the factors influencing its formation. From the results of these experiments, the authors have postulated a theory of the primary cause of wood grain.

## MATERIALS AND EQUIPMENT

All panels used for plating were cut from black plate (low-carbon sheet steel about 0.010-inch thick), the base material from which commercial tin plate is made. Unless otherwise stated, all panels were plated in the small circulation cell, a mechanism that simulates commercial strip-plating conditions by circulating electrolyte past the panel at adjustable rates equivalent to mill-strip speeds.[1] Figure 2 illustrates the principle of the cell only and does not represent all the refinements that have been made to the actual equipment. The rapid circulation of electrolyte in this cell permits use of the high current densities used in mill operation. The plated area on circulation-cell panels measures 9⅝ by ¾ inches.

## EFFECT OF TYPE OF PLATING ELECTROLYTES

Because of practical considerations, this investigation was concerned primarily with wood grain as formed on tin plate produced from the stannous phenolsulfonate electrolyte; however, wood grain has been produced in this Laboratory from all the following tin-plating electrolytes.

(1) Alkaline stannate
(2) Stannic chloride
(3) Stannous phenolsulfonate
(4) Stannous pyrophosphate
(5) Sulfamic acid[2]
(6) Sulfuric acid

Table I shows the electrolyte compositions from which wood grain was produced. Investigations with various types of tin-plating electrolytes indicated that wood grain was not

**TABLE I**

**COMPOSITION OF TIN-PLATING ELECTROLYTES**

| | |
|---|---|
| **Alkaline Stannate** | |
| Sodium stannate | 120 g/l |
| Sodium hydroxide | 20 g/l |
| **Stannic Chloride** | |
| Stannic chloride | 100 g/l |
| **Stannous Phenolsulfonate** | |
| Stannous sulfate | 40 g/l |
| Phenolsulfonic acid | 15 g/l as $H_2SO_4$ |
| Dihydroxy diphenyl sulfone (Sulfone) | 6 g/l |
| **Stannous Pyrophosphate** | |
| Stannous pyrophosphate | 60 g/l |
| Potassium pyrophosphate | 200 g/l |
| Dextrin | 10 g/l |
| **Sulfamic Acid** | |
| Stannous sulfate | 55 g/l |
| Sulfamic acid | 50 g/l |
| Sulfone | 6 g/l |
| **Sulfuric Acid** | |
| Stannous sulfate | 55 g/l |
| Sulfuric acid | 15 g/l |
| Sulfone | 6 g/l |

a phenomenon associated with a particular tin-plating formulation, although it may be that some types of electrolytes have a greater tendency than others to produce wood-grained tin plate. No attempts were made to produce wood grain from the fluoborate or the chloride-fluoride (Halogen) tin-plating electrolytes, but it is likely that it could be done. All further data in this report relate to wood grain as produced from the stannous phenolsulfonate electrolyte.

In tin-plate production, tin-coating weight (or thickness) is reported in terms of pounds of tin per base box of steel sheet, or simply pounds per base box (lb/bb). A base box is 112 sheets measuring 14 by 20 inches, or about 13 by 13 feet (total area of one surface) of tin plate. Electrolytic tin plate is normally produced in any one of four coating-weight ranges (differentially coated sheet is omitted for the sake of simplicity). These weights are 0.25, 0.50, 0.75, and 1.00 lb/bb plate. These coating weights are equivalent to tin thicknesses of 15, 30, 45, and 60 millionths of an inch (on each surface) respectively. Throughout this paper, tin-coating weight or thickness will be referred to in terms of pounds per base box. The above figures may be used to convert lb/bb to inches of tin thickness if desired.

In commercial tin-plate production with the phenolsulfonate electrolyte, wood grain is confined to the 0.25 lb/bb surface. It was reported to have appeared once on 0.75 lb/bb plate, but this was never substantiated. It has on rare occasions been noted on localized areas, generally near the

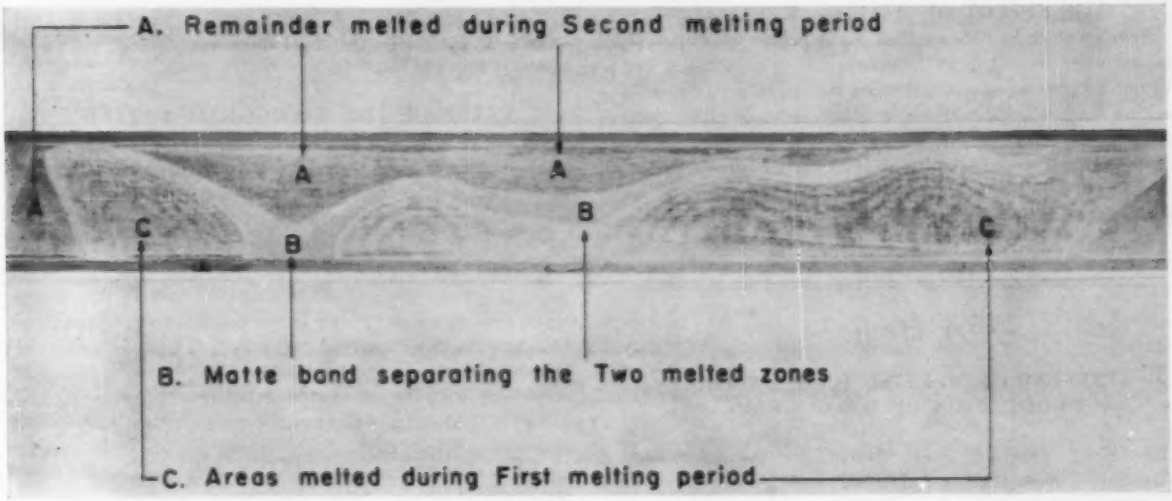


Fig. 3. Resistance-melted panel showing matte band between the two melted zones.

extreme edges of the strip, on 0.50 lb/bb plate. It has never been reported on 1.00 lb/bb plate.

The tin-coating weight range in which wood grain appears has been studied in this Laboratory. Five hundred panels were plated in the circulation cell at current densities covering the range 100 to 600 amperes per square foot (amp/sq ft), electrolyte temperatures from 80 to 120F, and coating weights from 0.05 to 0.50 lb/bb, with an electrolyte composition known to have a tendency to produce wood grain. Wood grain was made to appear on more than 150 of these panels by using various combinations of the above plating conditions. The coating-weight limits in which it appeared ranged from 0.10 to 0.40 lb/bb. The optimum coating weight for wood-grain production was 0.17 lb/bb. All experiments have shown that it is increasingly difficult to produce wood grain as the coating weight increases beyond about 0.25 lb/bb.

It appears then that one of the prerequisites in the production of wood grain is that the tin-coating weight must lie in a narrow range of approximately 0.10 to 0.40 lb/bb. Therefore, one of the simplest ways (although not usually an economical one) to eliminate wood grain when it appears is to increase the coating weight.

## THE EFFECT OF TYPE OF MELTING

Wood grain is never present on tin plate that has not been melted. It appears during the melting operation and the pattern persists on the quenched plate.

Wood grain was not produced on laboratory-plated panels (predisposed to wood grain by plating conditions) when the tin coating was melted in hot oil or by the direct-current electrical-resistance method. This observation is supported by the experience of many investigators over many years.

Wood grain is produced (when other factors are favorable) when tin plate is melted by the alternating-current resistance method. High-speed motion pictures (2500 to 4000 frames per second) of the alternating-current resistance-melting process showed that the formation of the wood-grain bands is coincident with the half-cycle of the alternating melting current; that is, one band forms every 1/120th of a second.

When wood-grained panels, which had melted over only part of the panel area, were submitted to a second melting period, which melted the remainder of the area, a matte band (which appears to be similar to, though substantially wider than, the matte alternating bands of the wood-grain pattern) was evident between the initially melted area and the area that melted during the second melting period, see Fig. 3. This observation suggests that the matte bands in the wood-grain pattern may be tin that had partially melted, was allowed to cool (though not to room temperature), and then was remelted. Examination of these panels indicates that such areas are not bright when remelted. The above observations indicate that the alternating matte bands of the wood-grain pattern may be caused by the partial cooling of the tin in these areas during the low-current input phases of the alternating-current cycle.

For some time, it was generally thought that wood grain could not be produced when tin was induction-melted. However, wood grain has since been made to appear on panels that were plated in the circulation cell under conditions which promote production of wood grain and were melted by using laboratory high-frequency induction-melting equipment (approximately 450,000 cycles per second). The pattern resembled that produced by 60-cycle alternating-current melting, except that the lines of the wood-grain pattern tended to be closer together on the induction-melted panels. It seems obvious that no significant cooling could occur between the cycles of a 450,000-frequency wave; therefore, if the interpretation of the appearance of the wood-grain bands given in the discussion of 60-cycle alternating-current cycle is valid, some other explanation of the appearance of wood grain on high-frequency induction-melted plate is required. Perhaps a resonance cycle built from the input 60-cycle wave and the output high-frequency wave provides the proper current pulse to produce the observed wood grain on induction-melted plate. No attempt was made to substantiate this.

Unless otherwise stated, all panels described in this report were melted by the 60-cycle alternating-current resistance method, which is commonly used in commercial tin-plate production.

## THE EFFECT OF RATE OF MELTING

Previous work had shown that panels which became wood grained when melted in an 1800-watt resistance melting unit did not become wood grained when melted in a 10,000-watt melting unit. To determine whether melting rate affects wood-grain production, 10 panels plated identically in the circulation cell under conditions favoring the production of wood grain were melted in the 10,000-watt resistance melter by using various power inputs. Table II shows that as the input voltage was lowered and the time required for melting correspondingly increased, identically plated panels that would not produce wood grain at the higher melting rates (panels 1, 2, 4, and 5) produced wood grain at the lower melting rates (panels 7, 9, and 10). It is evident then that rate of melting, which depends on the amount of power input, affects the production of wood grain: a slow melting rate tends to produce wood grain.

TABLE II

EFFECTS OF MELTING RATE ON THE PRODUCTION OF WOOD GRAIN

| Panel Number | Melting Potential, v | Melting Time, sec | Appearance of plate |
|---|---|---|---|
| 1 | 100 | 4 | Burnt panel |
| 2 | 50 | 4 | Burnt panel |
| 3 | 20 | 4 | Did not melt |
| 4 | 25 | 4 | Bright and clear |
| 5 | 20 | 5 | Bright and clear |
| 6 | 15 | 7 | Did not melt |
| 7 | 15 | 10 | Light wood-grain |
| 8 | 13 | 12 | Did not melt |
| 9 | 15 | 10 | Wood grain |
| 10 | 18 | 9 | Wood grain |

Panels plated in the circulation cell under conditions that promote the production of wood grain were annealed at 210C for 25 seconds prior to melting. No wood grain was produced during the subsequent melting. Because annealing at this temperature is known to affect the structure of tin, the above observation indicates that wood grain may be caused by grain size, crystal orientation, or other structural characteristics of the deposited tin.

## CAUSE OF THE WOOD-GRAIN PATTERN

By use of a micrometer accurate to 0.0001 inch, 20 wood-grained panels picked at random were measured for thickness of the base steel at the whorl centers and at other areas of the wood-grain pattern. The thickness of the tin coating (about 15 millionths of an inch) was not great enough to be an interfering factor.

In all but one instance the average thickness of the steel at whorl centers on any given panel was less than the average thickness at other areas of the panel. These differences of thickness were not great (0.0001 to 0.0003 inch) but were consistent, with the one exception noted.

Figure 4 shows a wood-grained panel with a tin coating that was only partially melted and illustrates how the melting begins at the whorl centers. The previously mentioned high-speed motion pictures of the melting process also showed that melting begins at the whorl centers. This evidence indicates that the steel gets hot first at these areas. The thickness measurements described above, showing that the cross section of the steel is generally thinnest at the whorl-center areas, might explain why these areas get hot first (they have higher resistance to the passage of current). This indication that the whorl centers tend to form at or near thin areas of the steel base is supported by the frequent observation in the past that when tin plate becomes wood grained on both sides of the sheet, the patterns are mirror images.

Support was given to the conclusion that whorl centers appear at thin areas when panels were thinned at certain areas by using sand paper to remove 0.0005 inch of steel, plated in the circulation cell under conditions that promote the production of wood grain, and melted. A whorl center was invariably produced at the thinnest area (Fig. 5 shows one such example). Possibly additional conditions (such as local inclusions) could also affect the local resistance of the steel base and thereby produce whorl centers, but these were not investigated. Experience to date indicates that the magnitude of the variations in steel-base thickness sufficient to cause a whorl center is very small (certainly less than 0.0001 inch). No panel has yet been found that was sufficiently uniform in thickness so that wood grain could not be produced when other factors were favorable.

There is some evidence, after consideration of the above

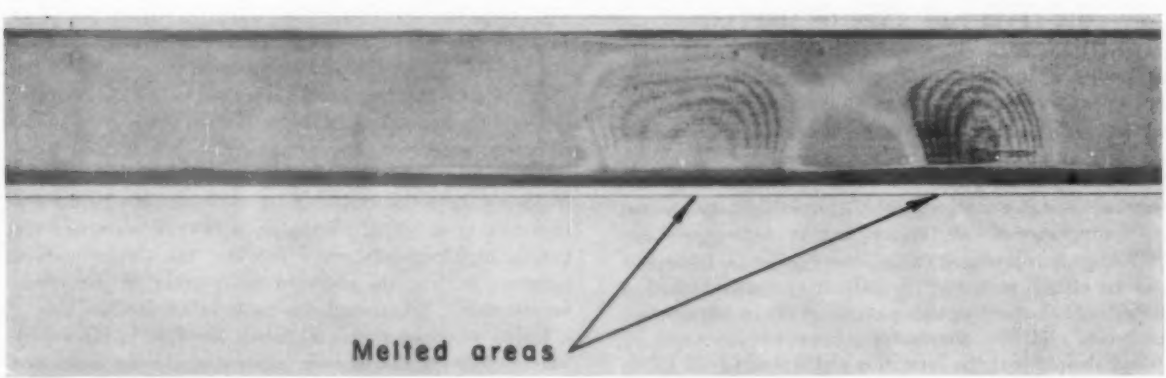


Fig. 4. Resistance-melted panel showing how whorl centers indicate areas where melting began.

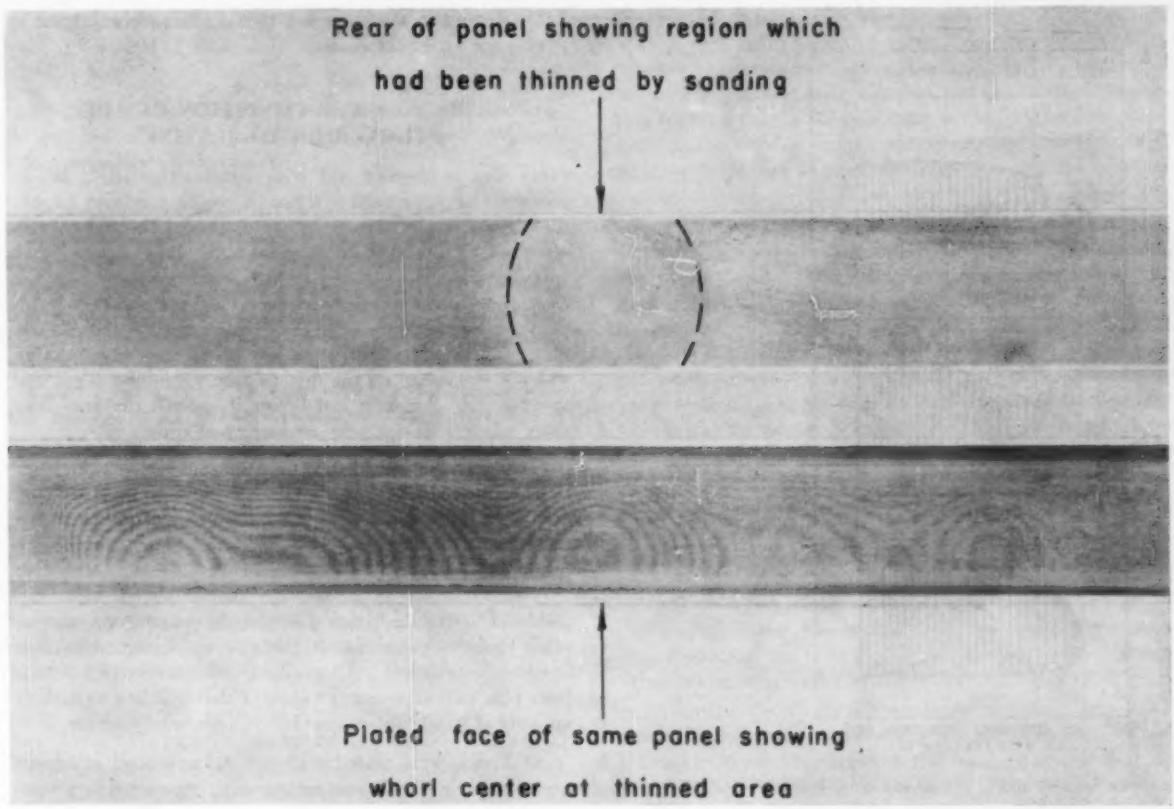
Rear of panel showing region which
had been thinned by sanding
Plated face of same panel showing
whorl center at thinned area

**Fig. 5.** How whorl center can be made to appear at a specified point by local reduction of the thickness of the steel base prior to plating.

facts, for regarding the wood-grain pattern as a contour map of the steel base.

## EFFECT OF ADDITION AGENTS

The work previously described under "Effect of Type of Plating Electrolyte" clearly shows that wood grain is not caused by addition agents. Several of these electrolytes contained no addition agent.

An additional experiment conducted to test this point involved plating panels in the circulation cell from the standard stannous phenolsulfonate electrolyte, except that 0.5 to 1.0 g/l of Bisphenol A addition agent was substituted for the conventional sulfone addition agent. Wood grain was produced...

Although the presence of an addition agent is not a prerequisite for the production of wood grain, a series of experiments with Tergitol NPX as a substitute for sulfone in the phenolsulfonate electrolyte indicates that addition agents can sometimes have a significant effect on the incidence of wood grain. Panels plated in the circulation cell with this electrolyte produced wood grain over a broader range of plating conditions (that is, at plating temperatures up to 164F) than have been obtained with the sulfone-containing electrolyte. The panel with the heaviest tin coating that has shown wood grain (0.40 lb/bb) was produced from this Tergitol-containing electrolyte. The heaviest wood-grained coating recorded from the sulfone-containing electrolyte was 0.36 lb/bb.

## EFFECT OF TIN CONCENTRATION IN THE ELECTROLYTE

Panels plated in the circulation cell from a phenolsulfonate electrolyte of low tin concentration (20 g/l as stannous ion) showed wood grain over a wide range of current densities and temperatures in the coating weight range 0.10 to 0.25 lb/bb. In contrast, it was difficult to produce wood grain under any conditions of current density, temperature, or circulation speed on panels plated from the phenolsulfonate elctrolyte of standard recommended concentration (35 g/l as stannous ion). The conclusion is that tin concentration in the electrolyte has a profound effect on wood-grain production: low tin concentration promotes the production of wood grain.

Several experiments designed to determine whether stannic tin concentration in the phenolsulfonate electrolyte affects wood-grain production indicated that it has no significant effect.

## EFFECT OF PLATING CURRENT DENSITY

Panels were plated in the circulation cell by using a phenolsulfonate electrolyte predisposed to wood-grain production because of low tin concentration (20 g/l of stannous tin.) Panels were plated at current densities of 100 to 600 amp/sq ft in increments of 100 amp/sq ft, at temperatures of 80F, 100F, and 120F, and at coating weights covering the entire range associated with wood-grain production. Circulation speed was maintained at 400 feet per minute.

Increasing the current density promoted the production of

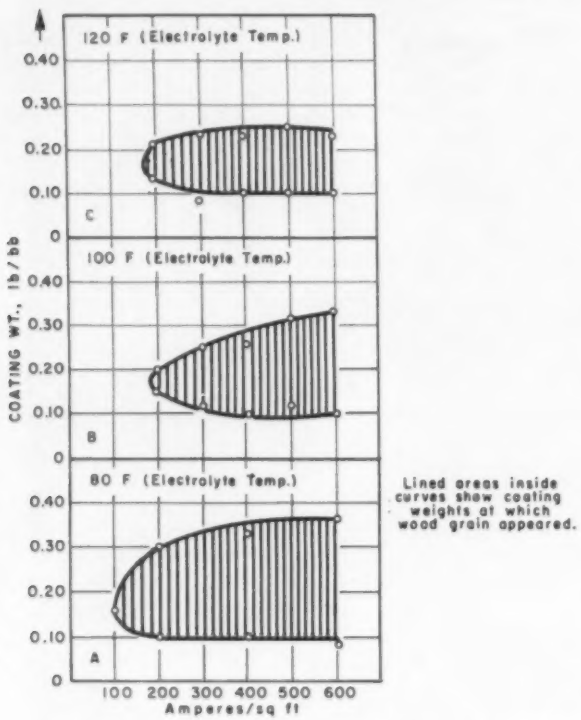


Fig. 6. Effect of current densities and temperatures upon wood-grain production.

wood grain. Figures 6A, 6B, and 6C show that the coating-weight range over which wood grain appears increased with increasing current density.

## EFFECT OF ELECTROLYTE TEMPERATURE

The same series of panels described in the preceding section illustrates the effect of temperature on the production of wood grain. Figures 6A, 6B, and 6C show that the coating-weight range in which wood grain appears widened as the temperature was lowered.

## EFFECT OF CIRCULATION SPEED (STRIP SPEED)

To check the effect of circulation speed on wood-grain production, panels were plated in the circulation cell from a phenolsulfonate electrolyte predisposed to wood-grain production because of its low tin content. Panels were plated at 100F at circulation speeds of 200 and 500 fpm, at current densities ranging from 100 to 600 amp/sq ft, and at coating weights covering the range in which wood grain appeared. The results were inconclusive. Decreasing the circulation speed appeared to increase the likelihood of producing wood grain at low current densities and to decrease the likelihood of producing it at high current densities.

In the section on "Effect of Type of Plating Electrolyte" it was reported that wood grain was produced from both still baths and circulating baths. This is evidence that circulation speed is not a critical factor in wood-grain production. It may have some influence on the incidence of wood grain but, as noted in the preceding paragraph, precisely what it does is not easily determined.

## EFFECT OF THE CONDITION OF THE STRIP PRIOR TO PLATING

(1) Panels liberally wet with water immediately before entering the plating cell will have a greater tendency to produce wood grain than will dry panels. This effect was observed in the mills many years ago. It was noted that spraying the strip with water just before its entry into the electrolyte would generally produce wood grain on 0.25 lb/bb plate; this was attributed to the dilution effect in the cathode film. Conversely, observation has shown that when plating was not conducted on the first pass or when electrolyte was sprayed onto the strip just before it entered the first pass, there was less tendency to produce wood-grain.

(2) Panels were pickled by using all conventional combinations of pickle polarity at current densities from 50 to 1000 amp/sq ft in a 5 per cent sulfuric acid solution, and then plated in the circulation cell. The effect of pickling on the production of wood grain was inconclusive. The results were very erratic. Mill experience has shown that changing the pickle polarity sometimes will produce wood grain and at other times will eliminate it, but that no consistent pattern has been established. All available information (laboratory tests plus mill experience) indicates that pickling variations are only of minor importance in wood-grain production.

(3) Panels were plated with nickel, chromium, or copper over half their lengths and subsequently tin-plated in a solution predisposed to wood-grain production. Wood grain was produced on many of the panels plated with chromium, copper, or nickel. In some cases, wood grain appeared on the half of the panel that had been preplated with any one of the above metals but not on the half that had not been preplated. The conclusion is that a steel base is not required for wood-grain production.

(4) Several panels of slow-corroding, box-annealed black plate and several panels of continuous-annealed black plate were tin-plated under identical conditions from a solution predisposed to wood-grain production. The box-annealed panels showed a greater tendency to produce wood-grain than did the continuous-annealed panels. These limited data

### TABLE III

### COMPOSITION OF FLUXING SOLUTIONS

| | |
|---|---|
| **No. 1 Phenolsulfonate Drag-out Flux** | |
| Stannous sulfate | 4 g/l |
| 65% Phenolsulfonic acid | 15 ml/l |
| **No. 2 Phenolsulfonic Acid Flux** | |
| 65% Phenolsulfonic acid | 76 ml/l |
| **No. 3 Phosphoric Acid Flux** | |
| 85% Phosphoric acid | 38 ml/l |
| **No. 4 Chromic Acid Flux** | |
| Chromic acid | 45 g/l |

led to the conclusion that some conditions produced as a result of annealing can have an effect upon wood-grain production.

(5) Mill experience has indicated that annealing borders, oxide films, or other surface contamination has sometimes caused local wood-grained areas.

## EFFECT OF FLUXING

Fluxing tends to inhibit wood grain, as indicated by panels fluxed for half their length in one of four different fluxing solutions. (See Table III for composition of fluxing solutions.) All these panels showed wood grain on the half that had not been fluxed and no wood grain on the half that had been fluxed.

Figure 7 shows a panel that had been fluxed in fluxing solution No. 1, Table III. Additional observations have shown, however, that the influence of fluxing is not always great enough to prevent wood-grain.

## EFFECT OF THICKNESS OF ALLOY LAYER

The thickness of the iron-tin alloy layer, which is always present on flow-melted tin plate, apparently has no effect on wood-grain production. Wood grain appeared on panels having alloy layers ranging from 0.02 to 0.18 lb/bb. Furthermore, the wood-grain pattern persisted through the alloy layer to the base metal.

## EFFECT OF IRON CONCENTRATION IN THE ELECTROLYTE

The report of an investigation made several years ago at this Laboratory indicated that the concentration of iron in the plating electrolyte had no effect on wood-grain production. Comparison was made between a solution containing 13.0 g/l of iron and one containing a "negligible" concentration of iron.

## INTERDEPENDENCE OF SECONDARY FACTORS PRODUCING WOOD GRAIN

Of the factors described above that have a bearing on wood-grain production, no single one acting alone can produce wood grain when certain of the other factors are unfavorable to its production. For example, when the tin concentration in the electrolyte is high (45 g/l or higher) and the temperature is normal, no manipulation of current density over the 0 to 600 amp/sq ft commercial operating range is likely to produce wood grain. For this reason, all the factors described above are regarded as secondary factors. It is believed that in the past, part of the difficulty in understanding the wood-grain mechanism was that one or another of these secondary factors was mistaken for the primary factor.

When so many factors affect the occurrence of a phenomenon such as wood grain, it is easy to attribute the cause to the wrong factor. For example, observation showed that raising the temperature of the electrolyte decreased the incidence of wood grain. But there is some reason to suspect that this effect may not be caused by the temperature alone, but by the greater solubility of the sulfone addition agent in the electrolyte at the higher temperature. If the temperature is quickly raised or lowered and the panels are plated before the sulfone concentration at the temperature has had time to stabilize, the effect expected at the new temperature will not be observed, and the reproducibility of previous tests conducted at the same temperatures will be poor.

## PRIMARY CAUSE OF WOOD GRAIN

Underlying the investigation of the secondary factors described above has been an attempt to discover the common denominator that might be the primary cause of wood grain.

Reviewing the results of the present investigation leads to the hypothesis that wood grain is directly related to and dependent on the structure of the tin deposit and that the grain size and/or the crystal structure of the deposit prior to melting is the primary cause of wood grain (tin grain size prior to melting should not be confused with tin crystal size after melting). The authors' theory is that all the secondary factors cited in this report affect the structure of the deposited tin in the same fundamental way.

The direction of the crystal growth of the electrodeposit is perpendicular to the grains of the base-metal surface, and the crystal size of the electrodeposit is markedly affected by the crystal size of the substratum. Usually a deposit follows the grain structure of the base metal for distances less than 5000 Angstrom units. If the base metal is influencing the grain size and structure of the deposit, it is

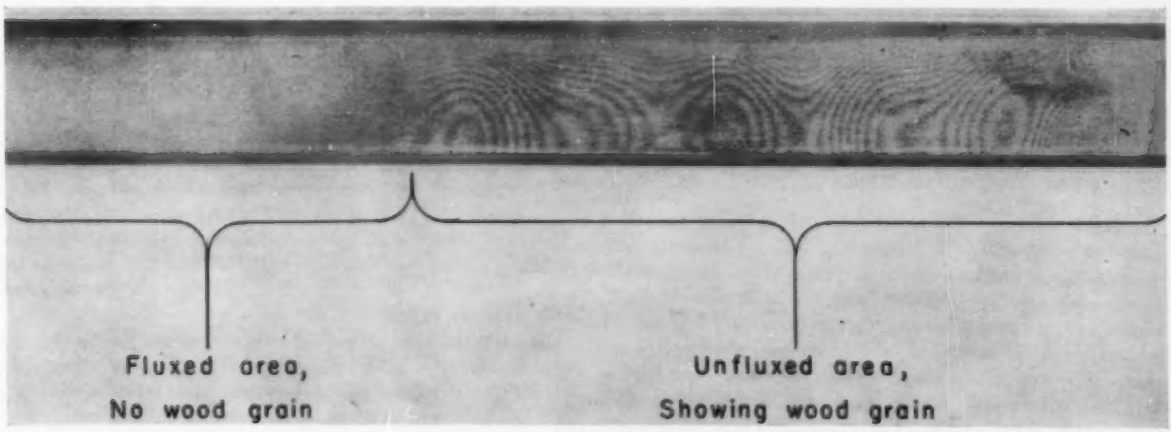


Fig. 7. Resistance-melted panel showing how fluxing prevented wood grain.

apparent then why the wood grain usually appears only on the tin plate coated to 0.25 lb/bb (3800 Angstrom units), and why the effect of the substratum is inoperative when the coating weight approaches 0.50 lb/bb.

The fact that annealing a panel plated under conditions that dispose it to produce wood grain will prevent wood grain upon subsequent melting lends strong support to the theory that the grain size and/or the structure is the primary cause of wood grain.

## SUMMARY

The present investigation has shown that the following secondary factors are prerequisites for the production of the tin-plate surface condition known as wood grain.

(1) Alternating-current resistance melting, induction melting, or any other method that produces certain degrees of cyclic-heat input.

(2) A critical coating weight covering the approximate range 0.10 to 0.40 lb/bb with an optimum point at about 0.17 lb/bb.

The following are the chief secondary factors that promote the production of wood grain.

(1) Slow rate of melting.

(2) Low tin concentration in the electrolyte.

(3) High current density.

(4) Low temperature.

The pattern of the wood grain is generally related to local variations in the thickness of the steel base metal. Three additional secondary factors affecting wood-grain production are the condition of the strip prior to plating, fluxing, and addition-agent activity.

The crystal structure and/or grain size of the deposited tin prior to melting is theorized to be the fundamental cause of wood grain. All the secondary factors listed above are considered to tend toward the production of the same type of tin-deposit structure believed to be responsible for wood grain. It should be possible to prove or disprove this theory by examining, under the electron microscope and by X-ray diffraction techniques, wood-grained samples produced under various conditions.

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# DECORATIVE PLATED COATINGS OF IMPROVED DURABILITY

by D. M. BIGGE**

THE MEANS OF OBTAINING improved service performance of plated parts used on exterior applications on automobiles has received attention from Technical Committees for several years. Prior to the time of the Korean conflict, programs to evaluate out-of-door performance of steel and zinc base die castings plated with various thicknesses of copper-nickel-chromium were underway in ASTM Committee B-8.[1] Test panels were placed on racks for out-of-door exposure at New York City, New York; Kure Beach, North Carolina; State College, Pennsylvania; Pittsburgh, Pennsylvania; and Coral Gables, Florida. A comparison of the rating numbers assigned to the test panels after one, two or three years of atmospheric exposure indicated an improved performance for test panels plated with two layers of nickel, with a buffing of the first layer of nickel performed prior to the plating of the second layer.

The report on the exposure tests[2] of these panels two years later stated that, "the double nickel coating found to be so beneficial in a sea-coast environment is equally beneficial in the rural exposure at State College, Pennsylvania."

At about the time this report was being presented at the 1953 Annual Meeting of ASTM, specifications for plating of automobile bumpers generally required the use of either (1) bright nickel and chromium, (2) semi-bright nickel and chromium or (3) copper-bright nickel and chromium. It was necessary to buff the semi-bright nickel before chromium plating in order to produce a finish having an acceptable decorative appearance.

The semi-bright nickel process had been employed since October 1945 for the plating of automobile bumpers, replacing the widely used Watts nickel process because the semi-bright nickel had better leveling properties and was much easier to buff.

However, as labor costs of buffing increased, the possibility of eliminating or reducing these costs by depositing a bright nickel over the semi-bright nickel layer was investigated. This process was used on automobile bumpers a number of years ago, and has continued in use on these parts. Its use has also been extended to other steel and zinc base die cast decorative parts.

Just prior to the time when the semi-bright and bright nickel combination was released for use on production parts, preliminary corrosion tests indicated that this process was providing a nickel plate that had excellent resistance to corrosion. Further testing was started in order to evaluate this indicated improvement. Test panels of steel of a composition similar to that used in making bumpers and also panels of zinc base die cast alloy were plated with every commercial nickel plating process, followed by the widely used chromium plating process in the then specified thickness of ten millionths of an inch of chromium.

Preparation of these test panels began soon after commercial use of the process on automobile bumpers. At that time some plating specifications for zinc die cast parts used on exterior applications on automobiles required 0.3 mil copper plus 0.5 mil nickel, plus 0.010 mil chromium. (1 mil = 0.001 inch.)

Earlier programs to evaluate the effect of thicker nickel coatings on the performance of plated zinc base die castings had reached the point where it was clearly indicated that improved service performance could be obtained if the die castings were plated with a thicker nickel plate. Therefore, zinc die cast test panels were plated with 0.3 mil copper, followed by either 0.5 or 0.9 mil of nickel and then with 0.010 mil of chromium. This program included the use of bright nickel in a single layer, or a combination of semi-bright and bright nickel in thicknesses of 0.5 or 0.9 mil, so that the comparative out-of-doors performance could be determined.

The steel test panels were plated with either 1.0 or 1.5 mils of nickel followed by 0.010 mil of chromium. All commercial bright nickels, semi-bright nickels, Watts nickel and the combination of semi-bright plus bright nickel were used in the plating of the test panels. Duplicate sets of steel panels plated with each process were provided for the exposure sites, in order that the test panels might be placed on exposure in a bent and unbent condition. Since plated steel parts such as bumpers or bumper guards are frequently bent by impact in service, the effect on the corrosion protection afforded by the different nickel plating processes on such parts is of interest. Five duplicate test panels made up each set.

Sixteen nickel plating processes were used in the plating of the zinc base die cast test panels, and twenty-eight nickel plating processes were used in the plating of the steel panels. The thickness of nickel plate on each panel was determined by use of a magnetic tester prior to placement of test panels on atmospheric exposure. The thickness of nickel and/or copper plate on the test panels placed on exposure was within 10 per cent of the thickness specified. Exposure of four test panels plated by each process studied was made at each test site. The sites used were at Miami, Florida; Detroit, Michigan; and Pittsburgh, Pennsylvania. The fifth test panel of

* Originally presented at the SAE National Automobile Week Meeting, The Sheraton-Cadillac Hotel, Detroit, Michigan, March 15-17, 1960
** Chrysler Corporation, Detroit, Michigan

each lot was evaluated by the Corrodkote test, in order to establish correlation between this newly developed accelerated test and actual out-of-doors performance.

After one year of exposure out-of-doors at the three sites, the plated steel and zinc base die cast test panels were rated, employing the method developed by Section D of Subcommittee II of ASTM Committee B-8. These data clearly showed better performance of the steel and zinc base die cast test panels which were plated with semi-bright and bright nickel and chromium in all thicknesses of plate employed in the program and at all exposure sites used.

The zinc die cast panels plated with 0.3 mil copper plus 0.9 mil nickel plus 0.010 mil chromium were rated after one year's exposure at Miami, Florida. The panels plated with the commercial bright nickel processes and chromium were given rating numbers from 3.25 to 5.5 for an average of 4.5, as compared to those plated with semi-bright, plus bright nickel and chromium, which were rated at 7.2. Similarly plated panels were rated after one year's exposure at Detroit, Michigan, and those plated with the commercial bright nickel processes and chromium were rated from 5.5 to 7.42 for an average of 6.75 as compared to those plated with semi-bright, plus bright nickel and chromium which were rated at 10.

The similar lot of zinc die cast test panels was rated after one year of out-of-door exposure at Pittsburgh, Pennsylvania. The panels plated with bright nickels plus chromium were rated from 7.13 to 9.63 for an average rating of 8.33, as compared to a rating number of 10 for those test panels plated with semi-bright plus bright nickel and chromium. It was of interest to note that similar lots of zinc die cast test panels employing 0.9 mil of buffed Watts nickel over 0.3 mil copper and a final plate of 0.010 mil chromium were rated as follows, after one year of out-of-door exposure: at Miami, Florida—a rating of 8.55; at Detroit, Michigan—a rating of 9.75; and at Pittsburgh, Pennsylvania—a rating of 10. It was of further interest to note that the die cast test panels plated with the semi-bright plus bright nickel system and chromium were rated equal to or higher than similar test panels plated with equal thicknesses of buffed Watts nickel and chromium after one year's out-of-door exposure at Detroit and Pittsburgh. The rating numbers assigned to the panels after one year's exposure at Miami, Florida were 8.55 for the zinc die cast test panels plated with 0.3 mil copper, plus 0.9 mil buffed Watts nickel plus 0.010 mil chromium, as compared to a rating of 7.2 for similarly plated panels employing 0.9 mil of semi-bright plus bright nickel and chromium.

We will now compare the out-of-doors performance of steel test panels, plated with 1.5 mils of nickel plus 0.010 mil chromium, after one year's exposure at Miami, Florida; Detroit, Michigan and Pittsburgh, Pennsylvania. Our first comparison of out-of-doors performance will be made on unbent plated test panels. After one year of out-of-doors exposure at Miami, Florida, the panels plated with 1.5 mils of the bright nickels studied plus 0.010 mil of chromium were given ratings of 3.65 to 8.05 for an average of 5.9, as compared to a rating of 9.65 for test panels employing 1.5 mils of semi-bright plus bright nickel, under 0.010 mil of chromium.

Unbent steel panels exposed out-of-doors at Detroit, Michigan for one year were rated as follows: The panels plated with 1.5 mils of bright nickel plus 0.010 mil of chromium were rated from 6.85 to 9.2 for an average of 8.08, as compared to a rating of 10 for steel panels plated with 1.5 mils of semi-bright plus bright nickel and 0.010 mil of chromium. Unbent steel panels exposed out-of-doors at Pittsburgh, Pennsylvania for one year were rated as follows: The panels plated with 1.5 mils of bright nickel plus 0.010 of chromium were rated from 4.9 to 8.65, for an average of 7.0, as compared to a rating of 10 for steel panels plated with 1.5 mils of semi-bright plus bright nickel and 0.010 mil of chromium.

To compare the effect of bending of the plated panel on the out-of-doors performance steel test panels were plated with 1.5 mils of all the bright nickels included in this program plus 0.010 mil of chromium, and with 1.5 mil of semi-bright plus bright nickel and 0.010 mil of chromium. All of these panels were bent in a similar fashion and then placed on exposure in this bent condition at Detroit, Michigan and at Pittsburgh, Pennsylvania.

Figure 1 shows the method of bending plated panels for atmospheric exposure tests. Two Vee Blocks with rounded tops are placed on the table of a tensile testing machine so that the distance from the tops of the vee blocks is 5½ inches. The test panel is placed on the two vee blocks with the plated surface of the panel facing downward. A one inch diameter steel rod is placed on the top of the test panel, equally spaced between the supporting vee blocks and perpendicular to the long sides of the panel. The load is applied by the tensile testing machine through the one inch diameter steel rod. A dial indicator is used to accurately determine

**TABLE I**

**CORROSION RESISTANCE RATINGS FOR ELECTROPLATED ZINC DIE CAST AND STEEL PANELS**

| | | Corrosion Resistance Ratings After One Year of Exposure at | | | | |
|---|---|---|---|---|---|---|
| | | Miami | Detroit | | Pittsburgh | |
| Basis Metal | Type of Nickel | Panels Not Bent | Panels Not Bent | Bent Panels | Panels Not Bent | Bent Panels |
| Zinc Alloys* | Bright | 4.5 | 6.75 | — | 8.33 | — |
| Zinc Alloy* | Semibright Plus Bright | 7.2 | 10 | — | 10 | — |
| Zinc Alloy* | Buffed Watts | 8.55 | 9.75 | — | 10 | — |
| Steel** | Bright | 5.9 | 8.08 | 6.04 | 7.0 | 5.92 |
| Steel** | Semibright Plus Bright | 9.65 | 10 | 10 | 10.0 | 9.15 |

*Plated with 0.3 mil of copper, 0.9 mil of nickel and 0.01 mil of chromium.
**Plated with 1.5 mils of nickel and 0.01 mil of chromium.

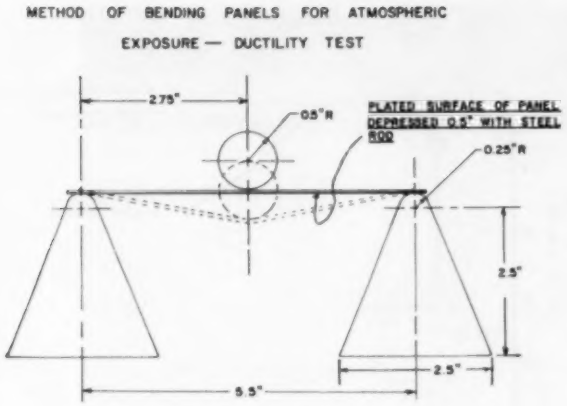



Fig. 1.

when the panel has been depressed 0.5 inch. The load applied by the testing machine is then released and the test panel is then placed on atmospheric exposure.

After one year of out-of-doors exposure at Detroit, the panels plated with 1.5 mils of the bright nickels included in this program plus 0.010 mil of chromium and exposed in a bent condition were rated from 4.1 to 7.35 for an average rating of 6.04 as compared to a rating of 10 for those panels plated with 1.5 mils of semi-bright plus bright nickel and 0.010 mil of chromium.

The steel panels plated with 1.5 mils of the bright nickel processes included in this program plus 0.010 mil of chromium and exposed out-of-doors in a bent condition at Pittsburgh, Pennsylvania for one year were rated from 5.1 to 7.65 for an average of 5.92, as compared to a rating of 9.15 for steel panels plated with 1.5 mils of semi-bright plus bright nickel and 0.010 mil of chromium and exposed in a similarly bent condition.

Figure 2 will illustrate the area of defective plating a part would have if rating numbers of 10 or less were assigned, and the defects were pin-point rusting. The appearance of plated parts having lower rating numbers was not continued to a rating of zero because it is assumed that even a rating of 8 represents a plated part of unsatisfactory appearance to most car owners. We have previously mentioned the rating numbers of both steel and zinc base die cast panels plated with copper and/or bright nickel and chromium and with copper and/or semi-bright plus bright nickel and chromium. The test panels plated with semi-bright plus bright nickel system gave the best all around performance at all exposure sites on both the bent and unbent test panels and the rating numbers assigned to these panels after one year of out-of-door exposure generally fell within the range of 8 to 10.

Some Process Standards currently in use for the plating of zinc base die castings and of steel with the semi-bright plus bright nickel and chromium coatings require that the plated zinc die casting shall have a rating number no lower than 9 and the plated steel part shall have a rating number no lower than 9.5 when tested in the Corrodkote Test.[3]

Figure 3 shows the performance of zinc die cast test panels plated with 0.3 mil of copper, followed by either 0.9 mil total of semi-bright plus bright nickel, or 0.9 mil bright nickel, plus 0.010 mil of chromium when placed on atmospheric exposure in Detroit on March 31, 1955. It should be noted that for the first six months (summer and fall) that all test panels were rated 10. However, as soon as the winter set in, the parts plated with the copper-bright-nickel-chromium plate, deteriorated to a rating of 9 after 3 months of winter exposure and to a rating of 7 after three more months of exposure. However, the test panels plated with the copper-semi-bright nickel plus bright nickel and chromium maintained a rating of 10 for the same exposure period of 12 months.

Figure 4 shows the performance of zinc die cast panels plated with 0.3 mil copper, 0.9 mil semi-bright plus bright nickel and 0.010 mil chromium and of similar panels plated with 0.3 mil copper, 0.9 mil bright nickel plus 0.010 mil chromium, when placed on atmospheric exposure in Florida on April 1, 1955. It is to be noted that the two sets of test panels maintained the original rating of 10 for 3 months, at which time the panels employing the straight bright nickel plate failed rapidly, reaching a rating of about 5 after 12 months' exposure. The test panels plated with the semi-bright plus bright nickel maintained the original rating of 10 for 9 months, at which time, deterioration began, reaching a rating of about 7 at the end of 12 months exposure time. This illustrates the prolonged period of initial appearance obtained by the use of the semi-bright plus bright nickel as compared to the use of the same thickness of bright nickel.

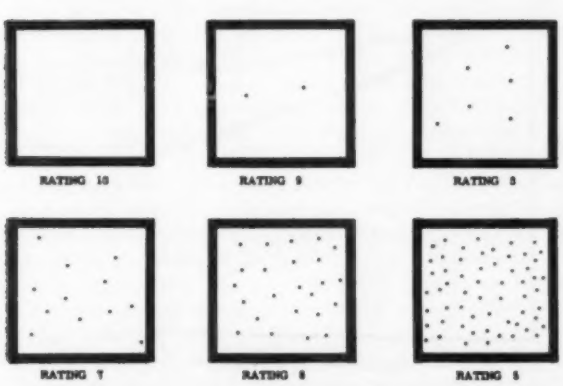



Fig. 2. Appearance of plated test panels having ratings of 5 to 10 when pin-point rusting is the defect.

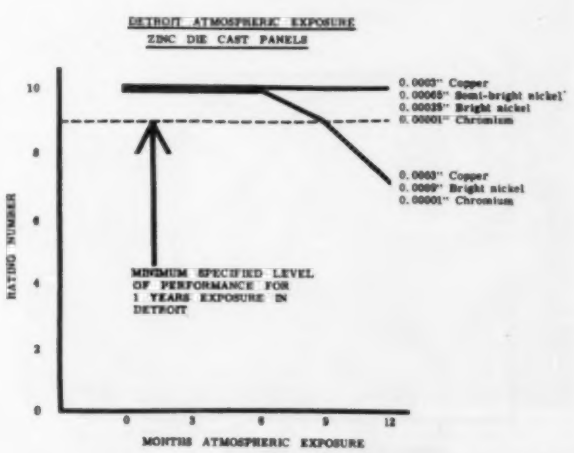



Fig. 3. Comparative performance of zinc die cast panels plated with bright nickel system and with semi-bright plus bright nickel system (Detroit exposure).

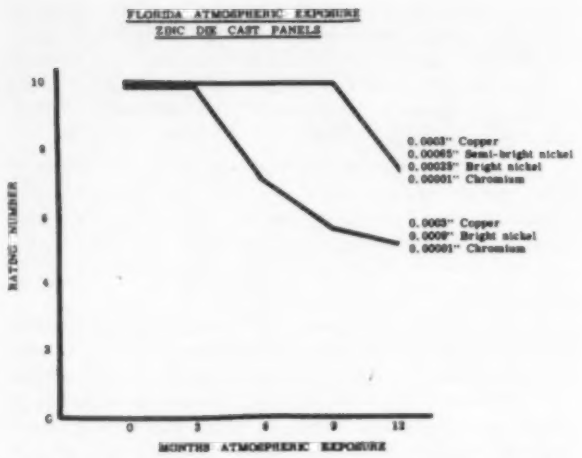



**Fig. 4.** Comparative performance of zinc die cast panels plated with bright nickel system and with semi-bright plus bright nickel system (Florida exposure).

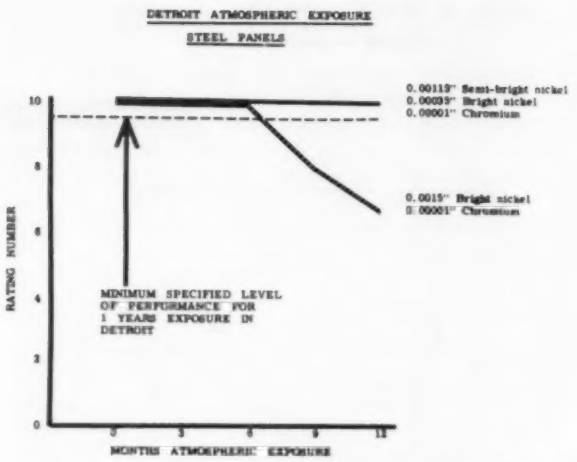



**Fig. 6.** Comparative performance of steel panels plated with bright nickel system and with semi-bright plus bright nickel system (Detroit exposure).

Figure 5 shows the performance of steel test panels plated with either 1.5 mils of semi-bright plus bright nickel or 1.5 mils of bright nickel followed by 0.010 mil of chromium. The panels plated with the semi-bright plus bright nickel and chromium maintained the original rating of 10 for nine month's exposure while the panels plated with 1.5 mils of bright nickel and 0.010 mil of chromium maintained the original rating of 10 for only three months. After one year of exposure the panels plated with the semi-bright plus bright nickel were rated 8 as compared to a rating of about 5 for those plated with the bright nickel.

Figure 6 shows the performance of steel test panels plated with 1.15 mils semi-bright nickel plus 0.35 mil bright nickel and 0.010 mil chromium. The original rating of 10 was maintained throughout the 12 months exposure. The steel test panels plated with 1.5 mils bright nickel plus 0.010 mil chromium maintained the original rating of 10 for six months and when winter arrived, started to deteriorate, reaching a rating of 7 after 12 months of exposure.

Figure 7 shows the results of a survey of cars in service in the Detroit area. The steel parts included in this survey were plated with either 1.15 mils semi-bright nickel plus 0.35 mil bright nickel and 0.010 mil chromium or with 1.5 mils bright nickel and 0.010 mil chromium. After 30 months of service the steel parts plated with the semi-bright plus bright nickel system had an average rating of about 9, while steel parts plated with the bright nickel system had an average rating of 6.

Both steel and zinc die cast parts plated with semi-bright plus bright nickel plate plus 0.010 mil of chromium perform better in service than do similar parts plated with the same thickness of bright nickel plus 0.010 mil of chromium. We have found that the ratio of thickness of the semi-bright and bright nickel is important. This is especially true on steel parts, such as bumpers and bumper guards, since these parts must frequently withstand impact. On such parts the requirements of our Process Standard limit the bright nickel plate thickness to 25 per cent of the total nickel thickness. This provides a greater thickness of the more ductile semi-bright nickel and reduces the tendency of the nickel plate to

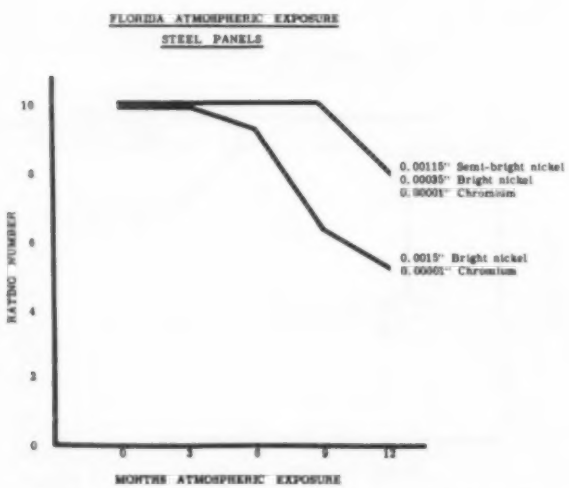



**Fig. 5.** Comparative performance of steel panels plated with bright nickel system and with semi-bright plus bright nickel system (Florida exposure).

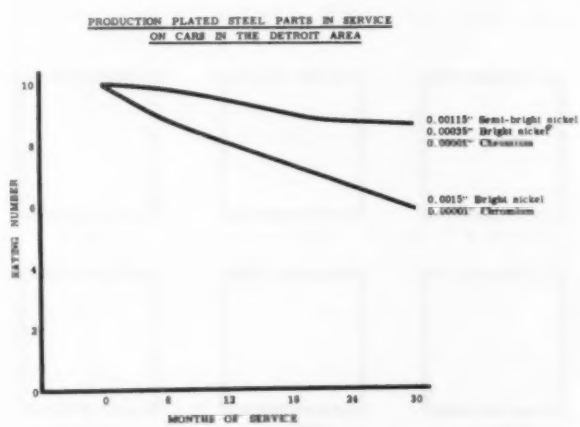



**Fig. 7.** Comparative service performance of steel parts plated with bright nickel system and with semi-bright plus bright nickel system on automobiles in Detroit.

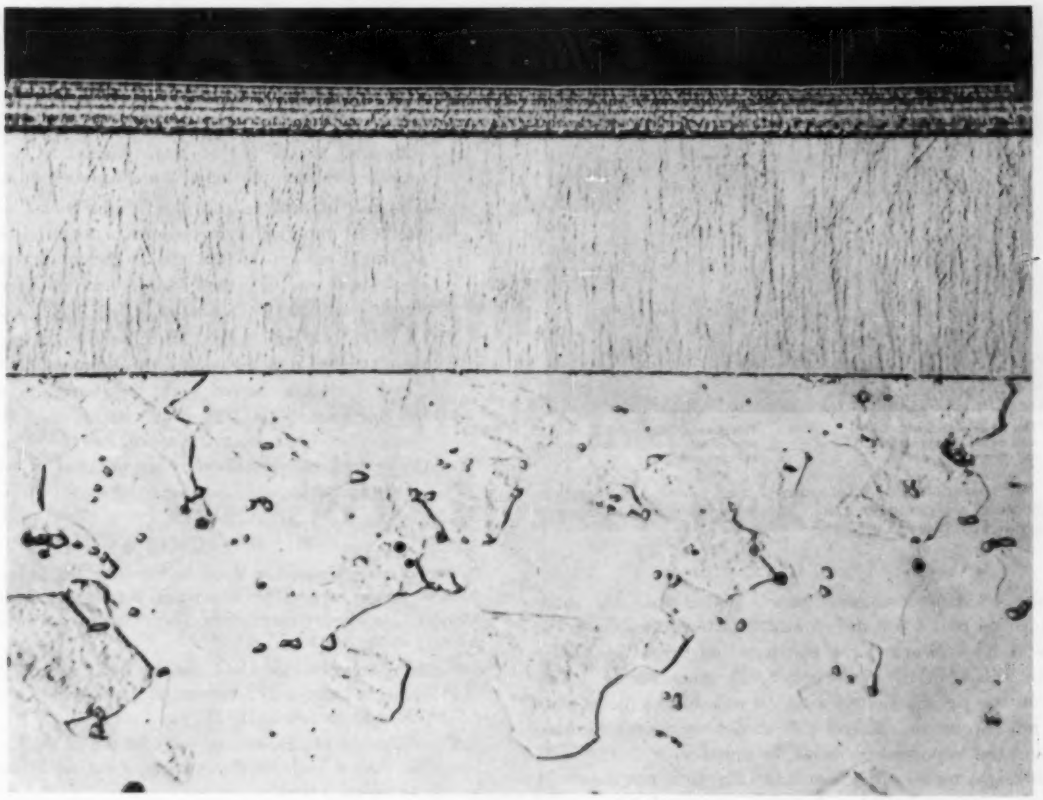


**Fig. 8.** Structure of semi-bright nickel, bright nickel and chromium plate on steel (Mag.—1000×) etched with concentrated nitric acid.

fracture through its entire thickness when subjected to impact. As zinc die cast decorative parts are not usually subjected to impact, the thickness of the bright nickel layer can be one-third the combined thickness of the semi-bright plus bright nickel layers.

We have also found that the best service performance as far as corrosion resistance is concerned is obtained from a system employing a semi-bright nickel which is sulfur free and on which a bright nickel containing sulfur is deposited. In this case, it has been observed by us and by others[4] that pitting which on bright nickel progresses continuously to the basis metal greatly slows down its rate of penetration at the interface of the nickel layers and then proceeds slowly laterally with a greatly reduced rate of vertical penetration.

Figure 8 shows the typical structure of the semi-bright, bright nickel and chromium plate. The semi-bright nickel layer should have a columnar structure as shown to obtain good corrosion protection. The bright nickel layer should be lamellar, as shown. It has been observed by ourselves and others[5] that inferior corrosion results are obtained when the semi-bright nickel has a banded structure.

The question can now be asked: "Can an improvement in durability be obtained by increasing the thickness of the bright nickel and will the use of 2.0 mils of bright nickel equal or exceed the performance of 1.2 mils of semi-bright plus bright nickel?".

Steel panels plated with a) semi-bright nickel and chromium, b) bright nickel and chromium and c) semi-bright plus bright nickel and chromium were placed on atmospheric exposure at Kure Beach, North Carolina for 1½ years.

Figure 9 shows two steel test panels after this atmospheric exposure. The panel on the left side is plated with 1.2 mils of semi-bright nickel plus 0.010 mil chromium. The panel on the right side is plated with 2.0 mils of the same semi-bright nickel plus 0.010 mil chromium. The improvement in corrosion protection of the thicker plate of semi-bright nickel is readily seen.

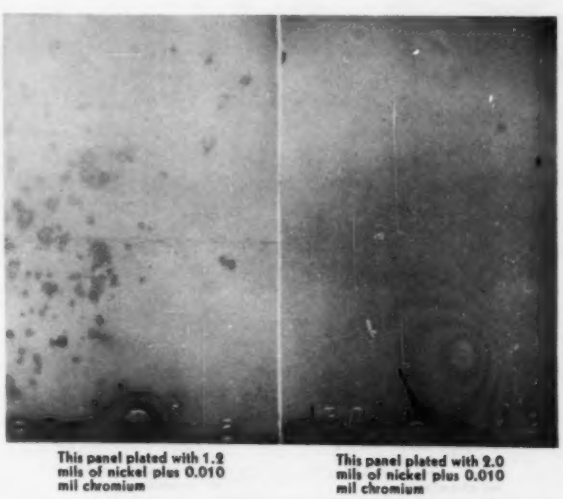
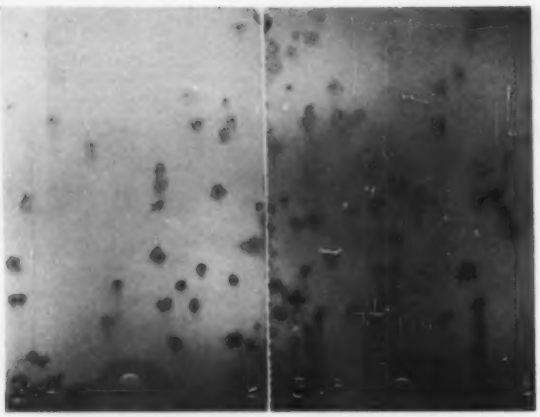

This panel plated with 1.2 mils of nickel plus 0.010 mil chromium
This panel plated with 2.0 mils of nickel plus 0.010 mil chromium

**Fig. 9.** Comparative performance of steel panels plated with semi-bright nickel and chromium after 1½ years atmospheric exposure at Kure Beach, North Carolina.



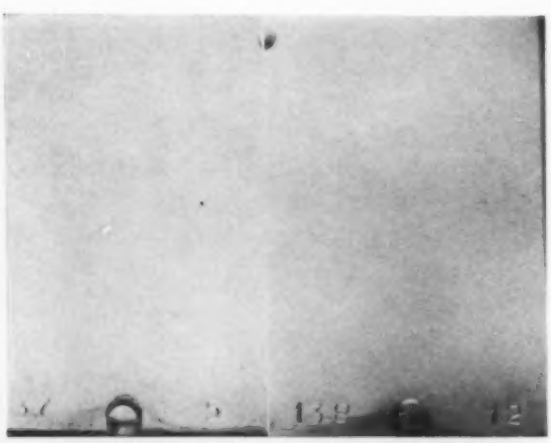
This panel plated with 1.2 mils of nickel plus 0.010 mil chromium

This panel plated with 2.0 mils of nickel plus 0.010 mil chromium

**Fig. 10.** Comparative performance of steel panels plated with bright nickel and chromium after 1½ years atmospheric exposure at Kure Beach, North Carolina.

Figure 10 shows two steel panels plated with the same bright nickel plus 0.010 mil chromium after atmospheric exposure at Kure Beach. The test panel on the left is plated with 1.2 mils of bright nickel plus 0.010 mil chromium. The panel on the right is plated with 2.0 mils bright nickel plus 0.010 mil chromium. Each panel shows considerable corrosion, and the improved performance noted with the 2.0 mils of semi-bright nickel plus chromium (Fig. 8) is not shown in this comparison of bright nickel in thickness of 1.2 and 2.0 mils.

Figure 11 shows two steel panels plated with the same semi-bright plus bright nickel plus 0.010 mil chromium. The test panel on the left is plated with 1.2 mils of nickel and the one on the right is plated with 2.0 mils of nickel. Chromium thickness in each case is 0.010 mil. It can be readily seen that both 1.2 mils and 2.0 mils thickness of semi-bright plus bright nickel provide excellent corrosion protection for the one and one-half year exposure at Kure Beach.



This panel plated with 1.2 mils of semi-bright plus bright nickel and 0.010 mil chromium

This panel plated with 2.0 mils of semi-bright plus bright nickel and 0.010 mil chromium

**Fig. 11.** Comparative performance of steel panels plated with semi-bright plus bright nickel and chromium after 1½ years exposure at Kure Beach, North Carolina.

This paper may be summarized as follows: One year's atmospheric exposure at Miami, Florida; Detroit, Michigan; and at Pittsburgh, Pennsylvania showed that:

1) The use of buffed Watts nickel or of semi-bright plus bright nickel gave decidedly superior performance as compared to the use of bright nickel in the copper-nickel-chromium plating of zinc base die castings.
2) The use of semi-bright plus bright nickel also gave decidedly superior performance as compared to the use of bright nickel in the nickel-chromium plating of steel, both on flat steel panels and on steel panels which were bent after plating.
3) One and one-half years atmospheric exposure of steel panels plated with nickel and chromium at Kure Beach, North Carolina showed that: Substantially increasing the thickness of the semi-bright nickel or of the bright nickel when used as a single nickel layer, does not match the performance obtained by the use of semi-bright plus bright nickel in multi layer coatings.

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He is a graduate of University of Detroit, College of Engineering, receiving degrees of Bachelor of Chemical Engineering in 1928 and Master of Science in 1929.

He is secretary of ASTM, Committee B-8 on Electrodeposited Metallic Coatings, chairman of Society of Automotive Engineers Subcommittee on Electroplating, a member of American Electroplaters' Society Project 15 Committee, and is past president of the Detroit Branch, AES.

He has been a member of the board of directors of the Kresge-Hooker Science Library, Wayne State University since 1951, and is also secretary-treasurer at this time.

# THE EFFECT OF SURFACE PREPARATION ON THE TENSILE STRENGTH, HARDNESS AND ADHESION OF ELECTRODEPOSITED NICKEL

by P. A. BROOK*


## ABSTRACT

In order to study the effects of surface preparation of the basis metal on the tensile strength of electrodeposited nickel a new method of measuring tensile strength has been developed. It is shown by statistical analysis that tensile strength and hardness are both independent of the surface preparations employed. The ratio of hardness to tensile strength observed in the present work agrees with previously reported values. The adhesion is shown to be markedly influenced by surface preparation and it is found that mechanically scoured surfaces give the lowest adhesion and that electropolished surfaces give some of the highest values.


## INTRODUCTION

WIDE VARIATIONS in the properties of electrodeposited metals can be obtained by a suitable choice of electrolyte and plating conditions. The literature relating the properties of electrodeposits to the variables of the plating process is extensive but comparatively little work has been published relating the condition of the cathode surface and the properties of the metal deposited thereon. Most of the literature[1-9] on this subject has been concerned with the effects of surface preparation on corrosion resistance and associated properties. Recently the American Electroplaters' Society has sponsored a project entitled "The Cleaning and Preparation of Metals Prior to Electroplating", in which the properties of nickel deposited on a copper base are related to the controlled contamination of the latter. In two recent reports[10,11] the effects of oxide thickness and of fatty acids films about one monolayer thick on adhesion are reported.

The present work reports the results of some measurements of the tensile strength, hardness, and adhesion of nickel deposited under carefully controlled conditions on a copper surface prepared in a number of ways.

Several methods of measuring the tensile strength of electrodeposited metals are available. Cuthbertson[12] produced massive deposits of copper and nickel and after grinding away the original cathode material he machined tensile specimens from the remaining deposit. Brenner[13] deposited nickel in a non-adherent form on a stainless steel cathode and prepared tensile specimens from the stripped foil. Neither of these methods can be used in the present work as the effects of surface preparation would be lost by detachment of the deposit from the copper. A new method of determining tensile strength was sought and it was finally decided to carry out tests on unstripped samples as they came from the plating bath.

Many methods of adhesion testing have been described but in a comprehensive review Ferguson[14] reports that only the Ollard test can be regarded as quantitative. The method used in this work was based on the Williams-Hammond[15] modification of Ollard's technique.

## EXPERIMENTAL PROCEDURE

The nickel deposits were prepared from a standard Watts solution containing 300 g/l nickel sulfate, 60 g/l nickel chloride and 38 g/l boric acid. The solution was prepared

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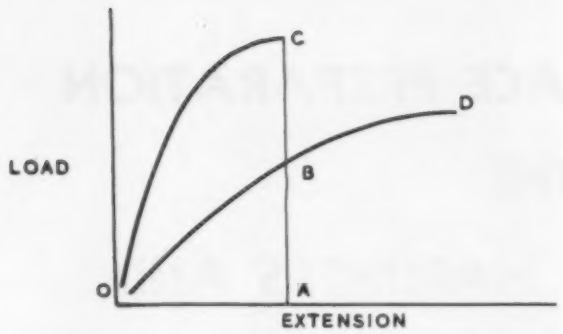


Fig. 1. Idealized load-extension curves for copper, OBD, and for nickel-plated copper, OC.

TABLE I

METHODS OF SURFACE PREPARATION

| Method | Preparation | C.L.A. Index of Prepared Surface (micro-inches) |
|---|---|---|
| A | Degreased in solution of 10 g/l NaOH, 15 g/l $Na_2CO_3$ at 20–60 asf. Dipped for 30 sec into a solution 435 cc/l $H_2SO_4$, 72 cc/l $HNO_3$, 2 cc/l HCl.[16] Rinsed in distilled water | 21 |
| B | Degreased as A. Etched in a solution of 10 g/l NaCN, 10 g/l NaOH for one hour. Rinsed in distilled water | 19 |
| C | Degreased as A. Scratch-brushed with 80 grade emery. Rinsed | 17 |
| D | As C but 120 grade emery | 15 |
| E | As C but 160 grade emery | 13 |
| F | As C but 200 grade emery | 12 |
| G | Degreased as A. Polished 000 emery, electropolished in 50% $H_3PO_4$ at 2 volts for 10 minutes. Rinsed in distilled water | 5 |
| H | Degreased as A. Electropolished as G. Rinsed in distilled water | 12 |
| J | Electropolished as G. Rinsed in distilled water | 11 |
| K | As H. Rinsed in 0.05% $H_3PO_4$.[17] Rinsed in distilled water | 10 |
| L | Degreased as A. Etched anodically for 10 minutes in 10% HCl at 20 asf. Rinsed in distilled water | 98 |

from high-grade reagents and distilled water, and the *p*H was adjusted to approximately 4 by adding either a slurry of nickel carbonate or dilute sulfuric acid. The solution was then worked overnight at a current density of 1 asf to plate out metallic impurities. Organic contamination was removed by stirring each litre of solution with 200 cc of activated charcoal followed by three filtrations through dense papers. In order to ensure maximum reproducibility of the physical properties of the deposit[13] each solution was worked at 40 asf until at least 30 amp hr per litre had been passed. High-purity sheet-nickel anodes enclosed in nylon bags were used for replenishment. Plating was carried out at a current density of 20 asf, a temperature of 40C, and *p*H of 4.0 ±0.1, this relatively low value being chosen because it has been shown to be that at which nickel deposited from a Watts bath attains its minimum hardness and tensile strength.[13]

The cathodes for measurement of tensile strength* and hardness were cut from O.F.H.C. copper sheet 0.023 inches thick, annealed at 500C for half an hour, and water quenched. The methods of surface preparation of the cathode surfaces are outlined in Table I. The third column headed C.L.A. (Centre Line Average) Index in the table gives a measure of the surface roughness after preparation as given by a "Talysurf" surface topography instrument. The values quoted are the averages of four measurements taken along two directions at right angles.

After preparation of the tensile test-pieces, their dimensions were measured and the specimens plated with 0.001, 0.00125, 0.0015 or 0.002 inches of nickel. The specimens were removed from the plating bath, washed, dried and tested in a Hounsfield Tensometer, Type W. In testing composite samples it was assumed (a) that the total load carried by the copper base and the nickel deposit was distributed between the two in the ratio of their cross-sectional areas, this assumption appearing valid because the value of Poisson's Ratio for copper and nickel are not very different, and (b) that the nickel and copper remain bonded during the test. Figure 1 shows idealized load-extension curves for copper specimens (OBD) and for composite copper-nickel specimens (OC). Such[18] reported that during the testing of similar nickel plated composite specimens fracture was always preceded by a cracking of the nickel deposit and that fracture invariably started from one of the puckers. Thus it appears probable that fracture starts in the nickel and if the nickel is completely ruptured before failure starts in the copper the load carried by the copper will be no longer equivalent to AB but to AC, which is greatly in excess of the ultimate tensile strength of copper. The copper will then fail without further noticeable elongation at an extension OA. If, on the other hand, failure starts in the copper before fracture in the nickel is complete the specimen will behave as if it were homogeneous.

Complete load-extension curves were obtained for each specimen and these were compared with OBD (Fig. 1) which was obtained by taking the mean of three load-extension curves for copper specimens. No test result was accepted unless fracture occurred within the two-inch gauge-length and unless the nickel and copper remained bonded throughout the test.

The micro-hardness of nickel deposits, 0.001 in. thick, was determined using a diamond pyramid indenter with a load of 30 g, this load being small enough to avoid possible errors due to the 'anvil' effect.

*Cathodes for tensile strength determinations were cut in accordance with British Standard Specification 485:1934.

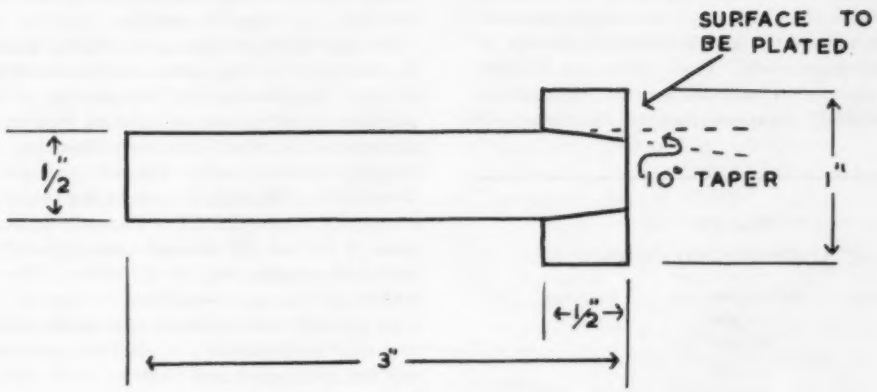


**Fig. 2.** Dimensions of adhesion test specimens.

The adhesion was calculated by depositing nickel onto the end of a suitably prepared copper bar provided with a flush-fitting collar, see Fig. 2, and measuring the force required to separate the copper and nickel. The thickness of the nickel must be great enough to ensure that failure does not occur by shear and for a specimen of radius 3/16 in., assuming the adhesion to be 40,000 psi[19, 20] and the shear strength of nickel to be 55,000 psi[21] the acceptable minimum thickness of nickel is approximately 0.1 in.[22] Nickel was deposited on five similarly prepared specimens each of which was inserted in a hole in 6 by 4 in. copper sheet to avoid high current density edge effects. For the first two or three hours the current density was kept at 20 asf but was then increased and maintained at 40 asf until the deposit was about 0.25 in. thick. The specimens were then cut from the guard sheet and mounted in a jig so that they could be tested in a Denison tensile testing machine. After fracture the radius of the bar at the plane of fracture was measured so that the adhesion could be calculated.

## DISCUSSION OF RESULTS

Table II summarizes the results from testing unplated copper specimens used to obtain curve OBD Fig. 1.

**TABLE II**
**TENSILE PROPERTIES OF COPPER TENSILE SPECIMENS**

| Area of Specimen sq in | Maximum Stress lb | Elongation per cent | U.T.S. psi |
|---|---|---|---|
| 0.0113 | 338 | 47 | $2.99 \times 10^4$ |
| 0.0118 | 338 | 47 | $2.86 \times 10^4$ |
| 0.0113 | 338 | 50 | $2.99 \times 10^4$ |
| | | Average | $2.95 \times 10^4$ psi |

The results of the tensile tests of composite samples are reported in Table III. In these tests it was observed that the nickel puckered at the edge as previously reported[13] and the fracture appeared to start from one of the puckers. The majority of the specimens broke so that the fracture was perpendicular to their axis, but in a few instances the specimens fractured at two places simultaneously so that a line joining the two points of fracture was at about 45° to the

**TABLE III**
**TENSILE STRENGTH OF ELECTRODEPOSITED NICKEL**

| Surface Preparation | Thickness of deposit in thousandths of an inch: 1.0 | 1.25 | 1.5 | 2.0 |
|---|---|---|---|---|
| A | 108 | 108 | 95 | 123 |
| | 111 | 106 | 109 | 120 |
| A | 110 | 102 | 105 | 104 |
| | 124 | 111 | 103 | 100 |
| B | 109 | 109 | 106 | 111 |
| | 123 | 109 | 102 | 106 |
| C | 104 | 109 | 109 | 112 |
| | 114 | 109 | 110 | 110 |
| D | 104 | 111 | 105 | 107 |
| | 112 | 111 | 105 | 106 |
| E | 108 | 109 | 116 | 116 |
| | 110 | 113 | 112 | 111 |
| F | 109 | 110 | 106 | 107 |
| | 106 | 106 | 110 | 108 |
| G | 108 | 112 | 118 | 106 |
| | 109 | 114 | 97 | 105 |
| H | 108 | 100 | 100 | 104 |
| | 109 | 95 | 111 | 108 |
| J | 107 | 105 | 100 | 106 |
| | 107 | 108 | 108 | 109 |
| K | 94 | 108 | 117 | 110 |
| | 98 | 110 | 99 | 106 |
| L | 118 | 108 | 110 | 116 |
| | 98 | 117 | 115 | 108 |
| | | Mean value 108 | | |

The values of U.T.S. are in $10^3$ psi.

axis. As a check on the method two samples of electrodeposited nickel from which the copper had been removed by machining were tested and the results obtained were $94 \times 10^3$ and $100 \times 10^3$ psi respectively. These figures are in agreement with those reported in Table III and this lends support to the view previously expressed that tensile strength of electrodeposited nickel can be determined fairly accurately from tests on composite samples.

TABLE IV

RESULTS OF ADHESION MEASUREMENTS

| Preparation | Adhesion, psi | Average |
|---|---|---|
| A | 36,900 | 36,500 |
| | 34,200 | |
| | 40,200 | |
| | 34,500 | |
| B | 41,700 | 36,800 |
| | 30,900 | |
| | 26,800 | |
| | 47,600 | |
| C | 4,700 | 11,100 |
| | 8,200 | |
| | 20,400 | |
| D | 9,900 | 8,200 |
| | 8,700 | |
| | 6,000 | |
| E | 13,300 | 21,500 |
| | 26,800 | |
| | 27,700 | |
| | 13,500 | |
| | 26,200 | |
| F | 10,500 | 13,100 |
| | 13,100 | |
| | 14,800 | |
| | 14,000 | |
| G | 23,900 | 28,000 |
| | 28,900 | |
| | 29,900 | |
| | 27,400 | |
| | 30,000 | |
| J | 51,600 | 44,700 |
| | 34,000 | |
| | 51,600 | |
| | 45,300 | |
| | 36,700 | |
| K | 49,600 | 43,900 |
| | 50,400 | |
| | 42,300 | |
| | 33,100 | |
| L | 34,500 | 42,700 |
| | 49,000 | |
| | 47,100 | |
| | 39,900 | |
| | 42,900 | |

In an attempt to evaluate the effect of surface preparation on tensile strength the results were analyzed statistically in a two-way classification for the analysis of variance. For purposes of analysis it was assumed that tensile strength is independent of both surface preparation and thickness. Using the method given by Kendall[23] the value of Z* is calculated to be 0.009 with 47 and 48 degrees of freedom. The assumption is accepted if $Z < Zq$ where Zq is the appropriate value of Fisher's Z[24] obtained from tables at the 5 per cent level with suitable degrees of freedom. The value of Zq is 0.1644 and thus the assumption is accepted.

In view of the established relationship between the hardness and tensile strength of electrodeposited nickel[13,25,26] it was not anticipated that hardness would vary with the surface preparations employed. Hardness tests were, however, carried out and the mean value of 114 determinations was 243 with a standard deviation of 12. Hardness variations are thus insignificant.

The linear relationship between hardness and tensile strength is claimed to be independent of the type of plating solution employed, and using Brenner's data[13] the average ratio of hardness to tensile strength becomes $2.37 \times 10^{-3}$ while Cuthbertson's results[12] give $2.38 \times 10^{-3}$ and $2.43 \times 10^{-3}$. In the present work the ratio is $2.25 \times 10^{-3}$ and the differences between all of these results are probably small enough to be explained by experimental errors.

It has been demonstrated that tensile strength and hardness of electrodeposited nickel are independent of surface preparation, at least in deposits of the thickness used. This conclusion is not unexpected since the measured mechanical properties are the properties of a bulk material. When one metal is deposited onto a second, there is a zone of adjustment for the lattice spacing of the first metal which in no case exceeds $10^{-3}$ cm thickness,[27,28] and if the equilibrium values of the lattice parameters are as close as for nickel and copper it is probable that the adjustment zone is much less than $10^{-3}$ cm thick. Within this zone it is possible that mechanical properties could vary but variations thus occurring in so thin a section of deposit would not, it is believed, be detectable in conventional tensile testing.

The results of the adhesion measurements are shown in Table IV. The values in the final column suggest that adhesion is greatly influenced by surface preparation. The results were analyzed in a one-way classification.[29] Z** was calculated to be 1.511 with 9 and 32 degrees of freedom and Zq obtained from Fisher's table[24] is 0.370 on the 5 per cent level and 0.761 on the 0.1 per cent. Thus $Z > Zq$ and it is

* $$Z = \tfrac{1}{2} \ln \left[ \frac{N - pq \sum_{ij} n_{ij} (x_{ij\cdot} - x_{\cdots})^2}{pq - 1 \sum_{ij} [\sum_k (x_{ijk} - x_{ij\cdot})^2]} \right]$$

where $x_{ijk}$ is the general member of the whole group
$x_{ij\cdot}$ is the mean of the $n_{ij}$ members of the sub-group formed by the co-incidence of one surface preparation with one deposit thickness.
$x_{\cdots}$ is the mean
p is the number of surface preparations, i.e. 12
q is the number of deposit thicknesses, i.e. 4
N is the number of $x_{ijk}$

** The definition of Z as used here is:

$$Z = \tfrac{1}{2} \ln \left[ \frac{N - p \sum_i (x_{i\cdot} - x_{\cdot\cdot})^2}{p - 1 \sum_{ij} (x_{ij} - x_{i\cdot})^2} \right]$$

where $x_{ij}$ is the general member
$x_{i\cdot}$ is the mean of the results from the i th preparation
$x_{\cdot\cdot}$ is the grand mean
p is the number of surface preparations used, i.e. 10
N is the number of $x_{ij}$

therefore concluded that surface preparation plays an important part in the mechanism of adhesion.

The variation of adhesion with surface preparation could have been anticipated to some extent since adhesion is likely to be influenced by variation in the physical conditions of the cathode surface but the mode of variation is somewhat unexpected. It was found that the four preparations that mechanically roughen the metal surface give low adhesion values and this observation immediately refutes the idea that a certain amount of "mechanical keying" is essential for the good adhesion of electrodeposits. On the contrary, the results after preparation methods G, J, K and L, which have C.L.A. indices of 5, 11, 10 and 98 respectively, suggest that adhesion is independent of surface roughness over the range here investigated.

It has been claimed[30] that adhesion is highest when deposition is upon a metallic crystalline surface and in view of this, it is surprising to find that surfaces which are covered with films of copper salts[31] i.e. those prepared by methods G, J and L, give some of the highest values of adhesion. However, the values obtained after preparations G, J, and L are of the same order as those obtained after preparation K in which the basic copper phosphate film had been removed by dissolution in a weakly acid solution and the results can be explained if it is assumed that the phosphate and chloride layers are removed by the weakly acid plating solution during the very early stages of deposition.

Linford and Feder[32] have shown that when nickel is deposited on a copper surface covered with an oxide film less than 650Å thick the film is completely dissolved, partly chemically and partly electrochemically. Another paper[10] discusses the effect of initial oxide thickness on the adhesion of nickel to copper. The adhesion is independent of initial thickness when this is less than 650Å and falls off thereafter as the oxide thickness increases above 650Å. This suggests that during the very early stages of the process the oxide film is removed and the deposition occurs directly on the metallic copper. Films thicker than the critical value are incompletely removed and the degree of removal is shown by the decrease in adhesion. It appears that a similar mechanism is responsible for the removal of basic copper phosphate and chloride films during the first parts of the process and consequently nickel is deposited directly on metallic copper. Similarly, surface preparations A and B are able also to remove oxide films on a copper surface.

The actual adhesion values of nickel on copper compare very satisfactorily with values of 37,800 and 39,400 psi reported by Hothersall[19] and of 30,000 and 45,000 psi given by Brenner and Morgan.[20]

## ACKNOWLEDGMENTS

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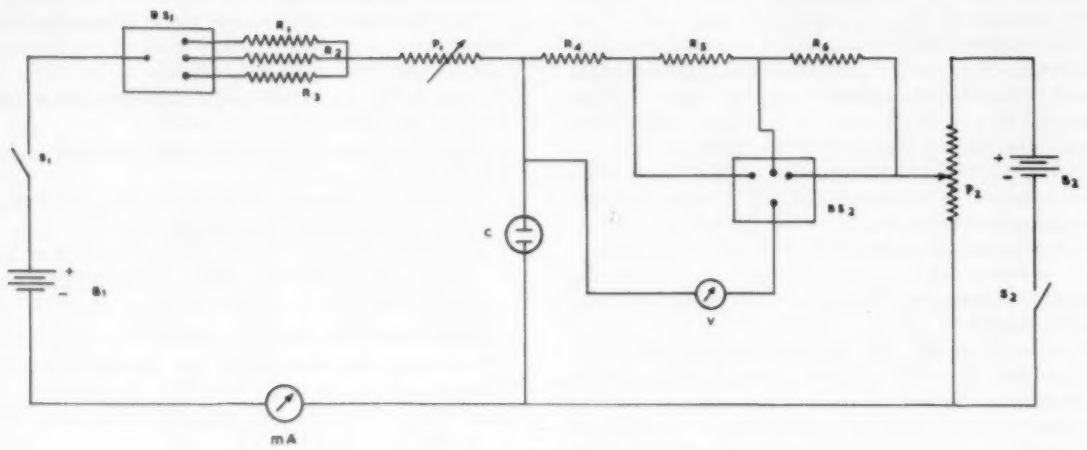


Fig. 1

# A PRECISION INSTRUMENT FOR TESTING THE THICKNESS OF ELECTROPLATES BY ELECTROLYTIC STRIPPING METHOD

by P. B. MATHUR*


## ABSTRACT

A simple instrument has been described for the measurement of the thickness of electroplates by electrolytic stripping method. The instrument involves current divider for the precise adjustment of the current, a potential divider for controlling the sensitivity of the voltmeter or potential recorder and a voltage balancing arrangement for balancing the initial voltage across the stripping cell. The end point indication is made by a sensitive voltmeter or a potential recorder. The instrument can be used for the precise measurements of complete range of thicknesses of various industrial metal coatings.


THE ANODIC STRIPPING method[1] consists in deplating electrolytically a certain known small area of the plated metal, at a constant current density. The electroplated article is made as anode and a stainless steel cell[2] as cathode. The circuit includes a milliammeter, a sensitive voltage measuring instrument, a high resistance and a battery which may supply a constant current to the cell. The stripping is carried out over a small area of the plated metal by a stripping solution which may have 100 per cent current efficiency and show a marked change in anodic potential and give a uniform and good spot at the end point of stripping. The indication of the end point of stripping of the plated metal is given by a sudden change in voltage reading of voltmeter connected in parallel with the cell. In the present paper an instrument is described which may be used for the precise control of the current and of the sensitivity of the voltmeter and for balancing the initial potential.

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## INSTRUMENT

Francis[3] and Satyanarayana and Roy[4] have described electronic instruments based on anodic stripping method for testing the thickness of electroplates. These instruments give the indication of the end point of stripping by switching off a neon lamp or an electronic timer controlled by a relay which itself is actuated by a definite change in the anodic potential. In Satyanarayana and Roy's instrument the relay is actuated by a change of 100 millivolts in potential. However, the change in end point potential is not one fixed quantity; it varies from few millivolts say 30 to 40 to several volts from combination to combination of plated and basis metals and also with the current density, the nature of stripping solution used in the experiment and sometimes with the thickness of the electroplate, also. Therefore, the use of electronic instrument in place of a voltmeter for the indication of the end point is liable to give incorrect indication unless all the conditions are standardized and the instrument is calibrated for various plated and basis metal combinations in respect to standard stripping solutions and definite current densities. Considering these difficulties, a simple instrument has been designed which does not require any calibration and works precisely and satisfactorily for all the different metal coatings of various thicknesses. The instrument can be fabricated at a plating shop itself.

The circuit diagram of the instrument is given in Fig. 1 and the model in Fig. 2.

$B_1$ = 90 volts battery
$B_2$ = 2 or 4 volts battery
V = vacuum tube voltmeter or a high resistance milli-voltmeter of 5 to 7 in. scale or a potential recorder.
mA = 0 to 50 mA range milliammeter of 5 in. scale
$S_1$ & $S_2$ = switches
$BS_1$ & $BS_2$ = three way band switches
$P_1$ & $P_2$ = 5 KΩ, 2 watts wire wound potentiometers
C = stripping cell
$R_1$ = 13 KΩ of 2 watts
$R_2$ = 8 KΩ of 2 watts

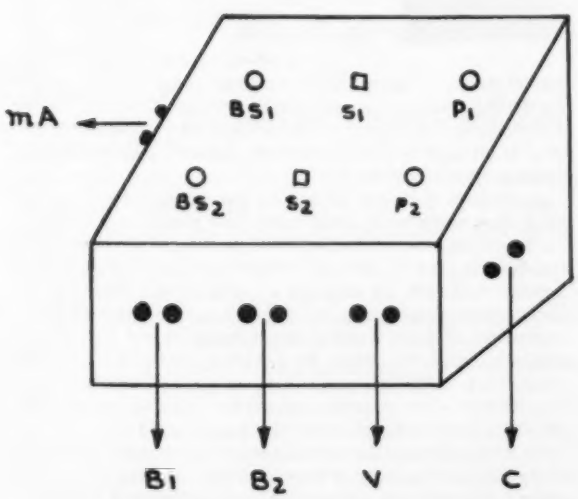


Fig. 2

$R_3$ = 3 KΩ of 2 watts
$R_4$ = 100 Ω of 2 watts
$R_5$ = 500 Ω of 2 watts
$R_6$ = 3 KΩ of 2 watts

The cell circuit part consists of the stripping cell, a 90-volt battery, and the resistances $R_1$ to $R_2$ placed in parallel and connected through a three way band switch $BS_1$ to a potentiometer $P_1$ used as variable resistor. Using a stripping cell having nearly 0.074 sq cm stripping aperture, described in an earlier communication, the most favorable current range has been found to be 5 to 30 milliamps. The values of the resistances $R_1$ to $R_2$ are so chosen as to give any value of current within 5 to 30 milliamps. The current in the circuit is adjusted by means of band switch $BS_1$ and the variable resistor $P_1$.

The second part of the circuit which consists of resistance $R_4$ to $R_6$, a band switch $SW_2$ serves as potential divider for controlling the sensitivity of the voltmeter. The voltmeter or potential recorder V can be connected across the resistances $R_4$ or $(R_4 + R_5)$ or $(R_4 + R_5 + R_6)$ by means of the band switch $BS_2$. When the change in voltage across the cell at the end point is sufficiently high of the order of few volts, the voltmeter should be connected across $R_4$ and when voltage changes are very low, the voltmeter connection should be made across $(R_4 + R_5 + R_6)$. Thus by means of band switch $SW_2$, the sensitivity of voltmeter can be altered. For safety reasons $SW_2$ should be kept in contact with $R_4$ before the experiment is started.

The potentiometer $P_2$ is used to balance the initial potential across the cell when stripping starts. Only a change in the voltage reading is therefore shown over the entire voltmeter scale.

## PROCEDURE FOR USING THE INSTRUMENT

Before starting the experiment the band switches $BS_1$ and $BS_2$ should initially be put at the lowest sensitivity ranges. The 90-volt and 2-volt batteries, milliammeter, voltmeter and the experimental cell terminals are connected at their proper plug points as indicated in the Fig. 2. The cell is placed over the electroplate and filled with the stripping solution. The switch $S_1$ is turned on and the proper current is adjusted by means of band switch $BS_1$ and then by $P_1$. The current should not be adjusted by short circuiting the cell terminals because in doing so, the current would be slightly less than the required value when the cell will be put in circuit, due to the internal resistance of electrolyte solution. The switch $S_2$ is then turned on. The initial potential is balanced by the potentiometer $P_2$. On the basis of the order of the change in potential at the end point of stripping, the sensitivity of the voltmeter is adjusted by $BS_2$.

The end point is indicated in the instrument by a sharp change in potential reading of the voltage measuring instrument. As any desired value of current within a range of 5 to 30 milliamps can be drawn, the instrument can be used for testing whole of the industrial range (0.02 to 2 thou) of thicknesses of electroplates. Here, the end point of stripping can be judged very accurately, as the complete change in the voltage reading recorded by potential recorder or is seen over a voltmeter scale and the kick of the voltmeter needle can easily be noted.

The cell current remains unaffected by making any adjustment in $BS_2$ or $P_2$ and by putting switch $S_2$ in on or off position. A discharged battery which may give fluctuating

voltage and thus may slightly affect the constancy of the current should not be used in the experiments. The initial voltage of the stripping cell system can be noted by contacting $R_6$ by means of $BS_2$ and putting the variable resistor $P_2$ in the minimum position so that the deflection observed in the voltmeter may be maximum. Depending upon the initial voltage of the cell, battery $B_2$ of proper voltage may be selected. In most of the cases, a battery of two volts is quite suitable. $B_2$ should never be of more than 4 volts.

During the period of stripping which is usually much less than three minutes, the current remains constant. The solutions which give large drift in potential would affect the constancy of current and so such solutions are not used for stripping purpose. The error due to potential drift can be calculated as follows:

Let the maximum allowed drift in potential be = 100 millivolts
The current passed = 5 milliamps

So, the change in cell resistance $= \frac{100}{30} = 3.33\ \Omega$

The total resistance of the circuit when a current of 5 milliamps is passing = 18K Ω

∴ The percentage change in resistance and hence in the current of the circuit $= \frac{3.33}{18000} \times 100 = 0.018\%$

When the cell current is 25 milliamps, the 100 millivolt drift will correspond to $= \frac{25}{5} \times 0.018\%$

$= 0.09\%$ difference in current

The stripping current 'C' can be calculated out for various metal coatings of different thicknesses by making use of the following equation:

$$C = (Km \times T)/t$$

where $Km = \left\{\frac{2.54 \times 10^{-3}}{60}\right\} \frac{Ad}{w}$. Here T is the thickness (thou), 'd' the density (gm/cm³) and 'w' the electrochemical equivalent (gm/coul) of the plated metal, 't' the time of stripping (minutes) and 'A' the area ($Cm^2$) of the stripped spot which is taken here as 0.074 cm². The values of the constant Km calculated for various metal coatings are given in Column 1 and the usual range of thicknesses of the various industrial coatings in column 2 of the Table I. The proper value of 't' can be chosen by considering the magnitude of the product (Km × T). For most of the electroplates the stripping current lies between 5 to 30 milliamps which corresponds to a stripping time less than 3 minutes. Copper coatings up to a thickness of one thou can be stripped out within three minutes using a current of 30 milliamps. For thicker plates of copper, either the stripping time should be increased or more than 30 milliamps current should be used in order to complete the process within 3 minutes. It is, however, desirable in this particular case, that the time of stripping should be increased.

So, precise measurements of the thickness of electroplates can be carried out with the instrument described here. The investigations on stripping solutions for various plated and basis metals combinations will be reported in a separate series of papers.[5–10]

**TABLE I**

| Metal | Thickness range in thou | Km |
|---|---|---|
| Silver | 0.0 to 1.6 | 0.0294 |
| Copper | 0.3 to 1.5 | 0.0847 |
| Nickel | 0.5 to 1.2 | 0.0104 |
| Cadmium | 0.5 to 1 | 0.0465 |
| Chromium | 0.01 to 0.3 | 0.0241 |
| Zinc | 0.5 to 1 | 0.0656 |
| Tin | 0.005 | 0.0467 |
| Gold | 0.005 | 0.0888 |
| Lead | 0.05 to 1 | 0.0174 |


## ACKNOWLEDGMENT

Thanks are due to Professor K. S. G. Doss, director, Central Electrochemical Research Institute, for his interest and helpful suggestions in this work.


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[4]Satyanarayana, S., and D. L. Roy, J. Sci. Ind. Res., **18A** (1959), 75.

[5–10]Mathur, P. B. and co-workers, J. Sc. Ind. Res. (In the course of publication).

**Dr. P. B. Mathur** was born at Allahabad, India, in 1928. He received his post-graduate degrees of MSc and PhD in physical chemistry from the University of Allahabad in 1953 and 1956 respectively. In 1957, he joined Birla College, Pilani as an assistant professor, and later in 1958, the Central Electrochemical Research Institute, Karaikudi, as senior scientific officer, where he is associated with a number of research projects pertaining to electrochemistry.

He has advanced and published mathematical theories in various fields of physical chemistry e. g., theories for the Phenomena of Chromotography, Diffusion, Kinetics of Thermal and Photochemical Reactions. He has designed a Bi-Planer Arrangement of Elements which is particularly useful in understanding the corrosion behavior of metals.

In the field of electrochemistry, he has discovered a process of solid phase reduction by which highly pure metals are obtained by the direct reduction of the crystals of metal salts, has developed a semi-flowing junction Method for the Measurement of the Liquid-Junction Potentials, has advanced a Thermodynamic Theory for the Specific Role of Electrolytes in Electrode Processes, obtained a Correlation Between the Standard Metal Potentials and their Atomic and Ionic Radii. At present he is working on the project of the Measurement of the Thickness of Electroplates by Electrolytic Stripping Method where stripping solutions for various industrial combinations of plated and basis metals have been worked out.

He is Life-Fellow of the Indian Chemical Society and Life-Member of the National Academy of Sciences, India. He has won several prizes in scientific essay competitions at the University of Allahabad.

# *It's Time to End the Confusion About Nickel Plating Processes*

## H-VW-M's New, Improved Levelume 220 is the Brightest Idea Among Today's Bright Nickel Baths

If you're confused, move over. So are a lot of other people in the plating business who are wading through the jungle of competitive claims.

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**SUPERLUME**

Superlume is the premium bright nickel, the ultimate in brightness building with leveling. Superlume is for those users who want tip-top performance to meet the finest possible finishing requirements and are willing to spend a little more for the very best. The cost difference often can be recaptured in total finishing costs.

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AES RESEARCH COMMITTEE MEETS AT NATIONAL HEADQUARTERS

LEFT—l to r, John P. Nichols, Clarence H. Sample, Dr. B. B. Knapp, Raymond L. Mitchell, Dr. D. Gardner Foulke, Dr. Harold J. Wiesner, Walter E. Moline, Whitney Snyder, Irvin M. Weiss. RIGHT—Research Committee at lunch. Clockwise from extreme left. Messrs. Mitchell Leeds, Moline, Nichols, Wiesner, Foulke, Snyder, Knapp, Sample and Weiss.

## RESEARCH COMMITTEE FINALIZES PLANS FOR A RESEARCH CONFERENCE, APRIL 24-25, 1961

Not only did the status of every 1960–1961 AES Research Project come under the quarterly appraisal of the National Research Committee at its meeting held at National Headquarters, Newark, N.J., on September 23, 1960, but the Committee, with Chairman D. G. Foulke presiding, also considered a number of other specific research subjects involving plating and metal finishing as possible future Project studies.

Vice Chairman for Research Harold J. Wiesner's status report as to AES's current Projects was the basis of the Committee's evaluation, and the discussion as to possible future Projects was led by Walter E. Moline, Chairman of the Subcommittee on New Projects.

Vice Chairman for Finance Raymond L. Mitchell reported on the AES Research Program's regionalized 1960–1961 campaign to stimulate expansion of the AES's ranks of Sustaining Members so vital in providing the wherewithal for financing the AES's important Research Program embodying specific Projects in American and Canadian universities and research foundations.

At that same meeting, the Research Committee also finalized plans for the conduct of a two-day Research Conference at the Bell Telephone Laboratories, Murray Hill, N.J., April 24–25, 1961, to be arranged by a special Conference Subcommittee headed by Subcommittee Chairman August Mendizza.

To be attended by the Research Committee; its District Supervisors; Project Chairmen; Project Committees; Project Directors; Project Fellows; Regional Research Finance Chairmen and Past AES Research Committee Chairmen so as to discuss the present and future of AES Research, the Society's Sustaining Members will also be invited to that significant Conference. A forum and a tour of the Bell Laboratories will also be important elements of the two-day program.

Present at the September meeting besides Messrs. Foulke, Wiesner, Mitchell and Moline were Secretary-Treasurer John P. Nichols, Dr. Burton B. Knapp, Whitney Snyder, Irvin M. Weiss and Clarence H. Sample.

## AES's 1960 TECHNICAL PROCEEDINGS DUE BY LATE NOVEMBER

Embodying, among other features, the 31 technical papers delivered before the AES's 47th Annual Convention that was held July 24–28, 1960 at the Statler-Hilton Hotel, Los Angeles, California, including the transcript of the discussion that attended the delivery of each such paper, the 1960 Edition of the AES's book TECHNICAL PROCEEDINGS is being speeded forward to completion.

Believed to compare favorably with the Society's internationally acclaimed Golden Jubilee Edition (1959), the 1960 Edition is expected to make its appearance for international distribution to all AES members in good standing as of November 1, 1960 by November-end 1960, despite the month's later-than-usual occurrence of the 1960 AES Annual Convention, a production record.

## FRANK TIRENDI HEADS 1960-1961 AES PAPER AWARDS COMMITTEE

To compose the AES's important 1960–1961 Paper Awards Committee that will select 1961 winners of the Society's ten respective Paper Awards for the best technical papers published during the fiscal year in PLATING MAGAZINE and TECHNICAL PROCEEDINGS, National President W. Andrew Wesley has named Frank Tirendi, Waterbury Branch, as Chairman, and William M. Tucker, Rochester Branch, and Dr. Martin S. Frant, Lancaster Branch, as members of the Committee.

Mr. Tirendi is associated with the Patent Button Company, Mr. Tucker with the Eastman Kodak Company and Dr. Frant with AMP, Inc.

LIFT! HELP YOUR BRANCH ATTAIN ITS MEMBERSHIP EXPANSION GOAL

## AMERICAN ZINC INSTITUTE SPONSORS AN ANNUAL AES PAPER AWARD

The Executive Board has accepted the invitation of the American Zinc Institute to sponsor an annual AES Paper Award recognizing, honoring and rewarding that technical paper published in PLATING MAGAZINE or TECHNICAL PROCEEDINGS during the fiscal year on the subject of zinc die castings plating adjudged best by the AES's Paper Awards Committee.

Consisting of a $50 cash award, a handsome laminated certificate and attendant recognition in AES publications, the American Zinc Institute's award, to be known as "Zinc Plating Award of AES," will expectedly be bestowed for the first time at the First Business Session of the Supreme Society at the AES's Boston National Convention, June 19, 1961.

This new Award now increases the number of such AES Paper Awards to ten, with arrangements for an eleventh now in progress.

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## AEROSPACE SYMPOSIUM PAPERS PUBLISHED AND AVAILABLE

Published by the Southwest Society of Aircraft Materials and Process Engineers (SSAMPE) and the Dallas-Fort Worth Branch of American Electroplaters' Society (AES), the transcript of the technical papers presented at the Aerospace Finishing Symposium held at the Hotel Texas, Fort Worth, on December 8–9, 1959, has made its appearance in multigraphed book form.

Priced at $7.50 each, copies of the book can be secured by sending direct order to SSAMPE, 1009 South Adams, Fort Worth, Texas. Full purchase price must accompany all such orders. SSAMPE is the only source for copies of the book. No such orders will be accepted at AES National Headquarters.

Numbering some 249 multigraphed pages, the book includes each of the 15 technical papers presented before that Texas Symposium. Subjects run the gamut from nickel plating through organic coating. Registrants from some 25 states attended that December 1959 joint Symposium of the AES's Dallas-Fort Worth Branch and SSAMPE.

# AES NEWS

## EIGHTH INTERIM MEETING TO BE HELD IN HARTFORD'S STATLER-HILTON FEBRUARY 11, 1961

With the AES's New England Regional Council as Host, and with the Society's Bridgeport Branch in charge of the hotel and other arrangements, the EIGHTH INTERIM MEETING of the Supreme Society of American Electroplaters' Society, Inc. will be held at the Statler-Hilton Hotel, Hartford, Connecticut, on Saturday, February 11, 1961. Richard C. Barrett and Allen Ferguson, both of the Bridgeport Branch, are serving as Co-Chairmen of the Region's Arrangements Committee.

At this writing, the Tentative Program is as follows:

**FRIDAY, FEBRUARY 10, 1961**

**9:00 a.m.—Executive Board Meeting (all day)**
**8:00 p.m.—Joint Meeting, AES Executive Board and Board of Trustees, Metal Finishing Suppliers' Association (MFSA)**

**SATURDAY, FEBRUARY 11, 1961**

**9:00 a.m.—Registration of Delegates and Alternates**
**10:00 a.m.—Business Meeting, Supreme Society**
**1:00 p.m.—Dutch Treat Luncheon Delegates/Alternates**
**2:00 p.m.—Business Meeting, Supreme Society**
**5–6:00 p.m.—Reception**

As other events, if any, are programmed by the Arrangements Committee, they will be added to the foregoing Program and reported in subsequent issues of PLATING MAGAZINE.

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## 1960-1961 CREDENTIALS COMMITTEE LED BY ROBERT L. GARRETT JR.

Branch-elected 1960–1961 Delegates and Alternate Delegates certified to the National Executive Secretary by Branches on or before November 7, 1960 as required by AES Bylaws will then be accredited by the 1960–1961 Credentials Committee which this fiscal year is composed of Robert L. Garrett Jr. (Kansas City Branch), Chairman, and Arthur W. Logozzo (Hartford Branch) and Joseph H. Shockcor (Lancaster Branch), members.

## NINE IMPORTANT EDUCATIONAL SESSIONS TO FEATURE AES's 1961 BOSTON NATIONAL CONVENTION

Considering a substantial number of original technical papers offered by title and profile by AES members and non-members for appraisal for presentation at the Educational Sessions Program of the 48th Annual Convention of the Society that will be held at the Statler-Hilton Hotel, Boston, Massachusetts, June 18–23, 1961 with the AES's Boston Branch as Host, the Editorial Board favorably considered 32 such offered papers tentatively at its meeting held in Boston, September 18. These authors will now be invited to submit either final abstracts or first drafts of the papers themselves for further Board evaluation at its meeting in Newark, December 16.

With Board Chairman John P. Nichols presiding, and with Host Branch Educational Program Chairman George J. Marotta leading the discussion, the Board not only appraised the offered papers by title and abstract but also grouped these into nine sessions extending from June 19 through June 22.

As tentatively planned, the impressive Educational Program in the making will lead off with the annual "William Blum Lecture", this edition to be delivered by Dr. Charles L. Faust, 1960 winner of the AES Scientific Achievement Award. That feature will be followed that same day by a Research Session featuring Research Project No. 14 and Research Project No. 15 papers, and a Research Program general presentation by the Chairman of the AES's Research Committee. A three-paper Organic Coating Session will occur elsewhere simultaneously.

The entire day, Tuesday, June 20, will be occupied by a morning and afternoon two-session, eight-paper "Finishing of Light Metals Symposium," being programmed for the Board by Dr. Gerald H. Kissin of the Kaiser Aluminum and Chemical Company and Charles Levy, Gillette Safety Razor Company. That vaunted educational event will be concluded by a "Finishing of Light Metals Forum."

Five general sessions running the gamut of other interesting electroplating and metal finishing subjects will occur Wednesday and Thursday.

Members present at the September 18 meeting besides the Board's Chairman and the Host Branch Educational Chairman were Dr. Henry Brown; Robert A. Ehrhardt; Dr. Henry L. Kellner; James H. Lindsay; Gerald A. Lux; Edward E. Oberland; Dr. Joseph V. Petrocelli; William H. Safranek; Dr. Edward B. Saubestre and Rodney Leeds. Present by invitation were Dr. George P. Swift, Charles Levy and Hubert H. Foley, members of the Host Branch Educational Committee.

**EDITORIAL BOARD CONSIDERS BOSTON CONVENTION EDUCATIONAL PROGRAM**

**(Left to right) Educational Program Co-Chairman Charles Levy, Dr. Henry L. Kellner, Educational Program Chairman George J. Marotta, Robert A. Ehrhardt, Dr. Edward B. Saubestre, Board Chairman John P. Nichols, Dr. Henry Brown, Gerald A. Lux, Boston Branch President Hubert H. Foley, Dr. George P. Swift, William H. Safranek, James H. Lindsay, Edward E. Oberland and Dr. Joseph V. Petrocelli.**

## LARGE AUDIENCE ENJOYS SECOND ANNUAL METROPOLITAN REGIONAL ASSEMBLY

by GUSTAV BITTRICH

President John Banta of the Newark Branch called the Second Metropolitan Regional Meeting at the Robert Treat Hotel, Newark, N. J., to order at 8:30 p.m. One hundred and eighty members and guests of both the New York and the Newark Branches were in attendance. Membership representation of each Branch was about equal. Roll call of the officers of both Branches showed all were present.

Branch President Banta presented Dr. W. Andrew Wesley, president of the National Society who exhibited great pleasure over the large turn-out for the evening's activities. He expressed in a few words the merits of regional meetings, and that Headquarters also favored this type of meeting. He suggested that perhaps this regional meeting could be expanded to include some of the other nearby Branches.

A moment of silence was observed in tribute to August Peter Munning who passed away this summer.

It was announced that David Clarin (Oakite Products Inc.) is retiring; and he was given a chance to tell of some of his early experiences as a member of this Society. He did this in his inimitably humorous style. Dave Clarin was given a standing ovation.

The second Lou Donroe Award was presented to Mario DiChiara for his timely topic on "Anodizing of Aluminum." It was suggested that he should expand his subject to a full lecture. The plaque for the Lou Donroe Award having been standardized, it was decided to present last year's recipient, Jim Shyne, with the new plaque.

Librarian Flavio J. LaManna presented Christopher Marzano, Amphenol Electronics Corp., whose subject was "How to Plate Difficult Metals." He covered such metals as aluminum and silicon bronzes; beryllium and tellurium coppers; lead alloys, such as pewter, brittania metal, etc.; high nickel, chromium, iron alloys; case hardened and high carbon steels; zinc die castings; aluminum, magnesium, silicon, molybdenum, tantalum and titanium. He outlined specifically the procedures which he found satisfactory. He discussed alternate procedures which others preferred. Needless to say, many questions were asked and before long many people either volunteered or were called upon to express their views. It was an interesting, highly informative talk, well presented.

The second speaker of the evening was Dr. A. Kenneth Graham whose subject was "Fundamental Considerations in Electrocleaning". He stated that most of us take electrocleaning too much for granted. He then proceeded to show how Faraday's Laws apply to good electrocleaning and electropickling; and that with amazingly good research in cleaners we had yet become forgetful, careless and neglectful. He cautioned us to observe good periodic maintenance in order to constantly correct faults which occur under normal plating conditions and thereby reduce our cleaner problems.

Both speakers were given a resounding vote of thanks and the meeting adjourned to partake of beer, cheese and crackers. This gave members of both Branches a good chance to renew old acquaintances.

## AES RESEARCH FEATURED AT BOSTON ANNUAL

AES Research was the theme of the 24th Annual Technical Meeting of the Boston Branch held at the Hotel Statler in Boston on Saturday afternoon, September 17. Robert L. Pierce, chairman of the Educational Program and Branch librarian, welcomed the members and visitors to the technical meeting and introduced the three speakers for the afternoon.

James D. Thomas, 1959–1960 chairman of the AES Research Committee, was the first speaker. He discussed the entire AES Research program.

Cleveland F. Nixon, head of the Electrochemistry Department of the Research Laboratories of General Motors Corporation and a member of the AES Project Committee, spoke about Research Project No. 15, "Accelerated Corrosion Tests for the Performance of Plated Coatings." He covered thoroughly the work that has been accomplished through accelerated testing. He provided a great deal of interesting data on the progress and results of corrosion tests.

William Geissman, National Lock Company, was the spokesman for AES Research Project No. 18 "Mechanical Finishing of Metal Surfaces." Project Director of Project No. 18, his informative presentation was illustrated with excellent color slides of the machine used in this research.

During the afternoon, the ladies attended a matinee performance of the Broadway hit show "A Raisin' in the Sun." The evening banquet was a gala affair with nearly 400 members and their ladies and guests in attendance. Following the distribution of many prizes and enjoyable entertainment, the banqueteers danced until a very late hour.

**BOSTON BRANCH STARTS FALL SEASON WITH ANNUAL MEETING AND BANQUET ON SEPTEMBER 17**

**(Top left) Cleveland F. Nixon, William Geissman, James D. Thomas, all speakers at the Educational Session, and Robert L. Pierce, Educational Program chairman. (Top, center) Listeners at the Educational Session. (Top, right) View of part of the ballroom during the Banquet. (Lower, left) Men with backs to camera, extreme left, Dr. Henry L. Kellner and, extreme right, Charles Levy. Partly hidden by Mr. Levy, Gerald A. Lux. (Lower, center) Left to right, Bernard J. Gaffney, Mrs. Gaffney, AES Honorary Member Andrew W. Garrett, Mrs. Garrett, AES National President W. Andrew Wesley, National First Vice President Chester G. Borlet, National Second Vice President Manuel Ben, Rodney Leeds, Boston President Hubert H. Foley. (Lower, right) Standing, 1961 AES Convention Chairman Louis V. Gagnon. Men seated, left to right, William Geissman, James D. Thomas, Cleveland F. Nixon and William H. Safranek.**

HONORED NATIONALLY AND BY DETROIT BRANCH. (Left to right) Herberth E. Head, Howard J. McAleer, Detroit Branch President Fred E. Olmstead, Walter L. Pinner and Wright W. Wilson.

## DETROIT BRANCH FETES FOUR OF ITS MEMBERS FOR AES HONORS

by GUY A. CUMMINGS JR.

At the Detroit Branch meeting of September 9 opening the Branch's 1960–61 educational season, the Branch proudly honored four of its members who were recipients of high AES national citations at the Society's National Convention in Los Angeles, July 24–28, 1960.

Detroit Branch President Fred E. Olmstead, opening the meeting, first called upon National Second Vice President Manuel Ben who introduced the four honored members and gave them Detroit Branch recognition for their National Awards.

National Past President Walter L. Pinner received two of the four honors. He was elected to AES Honorary Membership by the Supreme Society, then was announced at the Convention's Farewell Banquet as the first recipient of the new "Charles Henry Proctor Memorial Leadership Award," the highest non-technical award of the Society, for his outstanding leadership as Chairman of the Fifth International Conference on Electrodeposition and Metal Finishing.

National Past President Herberth E. Head received an Award of Merit from the Executive Board for meritorious service as Co-Chairman of the American Electroplaters' Society's First Industrial Finishing Exposition, and Howard J. McAleer received a similar Award of Merit for service as Chairman of the AES's Fifth Industrial Finishing Exposition, a large project held last year in Detroit.

Wright W. Wilson, General Chairman of the Golden Jubilee Convention, was honored by receiving the "Past Presidents "Award." This Award, presented for the first time, is given by the "Order of Past Presidents" for outstanding service to the Society.

This was a momentous occasion for the Detroit Branch to have four of its members receive these high national honors during the same year. The Branch congratulates them and shares their pride in the honors received.

The Educational Program that followed the Branch's recognition of these honored members marked an innovation in the type of program for this year. Under the direction of Vincent Cassidy and Richard A. Fellows, this first program was of the panel type—planned to treat separately, the various steps and operations in the plating process. Its subject was the polishing and buffing of the raw metal prior to cleaning and plating. The panel of able experts consisted of Howard J. McAleer, Formax Manufacturing Corporation; L.G. Belanger, Behr-Manning Company and Frank P. Romanoff, Apollo Metal Works. The panel was moderated by John Siefen of the John Siefen Company.

The very lively question and discussion period brought forth a surprising amount of audience participation and interest. Based on the enthusiasm and interest shown in this practical type of program, the coming year, with many more such panel programs planned, bids to be one of our liveliest and best attended.

## ANNUAL MEETING AND CHRISTMAS PARTY OF DETROIT BRANCH

The Annual Educational Session of Detroit Branch will be held at the Hotel Statler-Hilton in Detroit on the evening of December 2. It will be devoted to the subject "Service Performance of Automotive Decorative Trim." Speakers representing the "Big Three" automotive companies—Chrysler, Ford and General Motors—will discuss their surveys.

The following evening, Saturday, December 3, is the date of the Branch's Annual Christmas Party at the Statler-Hilton. There will be a communal Cocktail Party, the Dinner, a Floor Show, and then an Open House sponsored by suppliers.

## REMINDERS TO AES CHARTERED BRANCHES

**The list of your Branch's duly elected Branch Delegates and Alternate Delegates for 1960-1961 is due in the hands of the National Executive Secretary by or before *November 7, 1960*. The tenure (term of office) of these elected Delegates and Alternates is from the FIRST Branch meeting immediately following the 1960 Annual Meeting of the Supreme Society (Los Angeles, July 28, 1960) to the first Branch Meeting immediately following the 1961 Annual Meeting of the Supreme Society (Boston, June 23, 1961) or until their successors are duly elected by your Branch. Your list should be filed on the official form that has been provided to you by National Headquarters, and must be signed by both the Branch President and Branch Secretary.**

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**Your Branch's 1960-1961 fiscal year membership expansion quota is 10% over the number of your Branch's members in good standing as at June 30, 1960, meaning 10% more members than your Branch membership on July 1, 1960 before any subsequent suspensions or resignations for 1960-1961 Per Capita Tax purposes.**

♦

**Your Branch, via its accredited Delegates, has been invited to nominate any qualified member of the Society whom it chooses for consideration for AES Honorary Membership. Your choice must be supported by six copies of a statement of qualifications. These are all due in the hands of the National Executive Secretary by not later than *November 15, 1960* by the recorded rules of the Supreme Society. No nominations will be accepted after that date.**

♦

**Your Branch, through its President of record, will be invited to nominate any member of the Society whom it chooses for consideration for the Charles Henry Proctor Memorial Leadership Award for 1960-1961. More information soon.**

♦

**If your Branch is among those very few Branches that have delayed to now in appointing a Branch Research Finance Chairman to spearhead your Branch's effort to stimulate Sustaining Membership applications by industrial companies in your area, with the help of the Regional Research Finance Chairman for your territory, please do so promptly and submit his name to the National Executive Secretary's office at earliest possible time for processing.**

## 1960-1961 AES LIAISON REPRESENTATIVES WITH OTHER SOCIETIES

1. American Society for Testing Materials (ASTM)
   JOHN P. NICHOLS, American Electroplaters' Society, Inc.
   ASTM Committee A-5, Corrosion of Iron and Steel
   AUGUST MENDIZZA, Bell Telephone Laboratories, Inc.
   ASTM Committee B-8, Electrodeposited Metallic Coatings
   DONALD M. BIGGE, Chrysler Corporation
   ASTM Committee D-19, Industrial Water
   HENRY KAFARSKI, Chemical Processing Co.
   ASTM Committee B-7, Sub-Committee VI on the Anodic Oxidation of Aluminum and Magnesium Alloys
   RUSSELL V. VANDENBERG, Aluminum Company of America
2. American Standards Association (ASA) Committee Z-74 Performance of Effluent Air and Gas Cleaning Equipment
   GEORGE SCHORE, George Schore Associates
   ASA Committee Z-9, Sectional Committee on Safety Codes for Exhaust Systems
   W. R. FIDELIUS, Hanson-Van Winkle-Munning Co.
3. International Council on Electrodeposition & Metal Finishing
   WALTER L. PINNER, The McGean Chemical Co., (Chairman)
   DR. RICHARD B. SALSTONSTALL, The Udylite Corporation
   DR. WALTER R. MEYER, Enthone, Inc.
   MYRON B. DIGGIN, Hanson-Van Winkle-Munning Co.
4. Inter-Society Corrosion Committee
   C. O. DURBIN, Chrysler Corporation
5. Metal Finishing Suppliers' Association
   FRANK O. BEUCKMAN, Eastman Kodak Co.
6. National Association of Corrosion Engineers
   C. O. DURBIN, Chrysler Corporation
7. National Association of Metal Finishers
   ARTHUR G. PIERDON, Art Metal Finishing Company
8. National Technical Task Committee on Industrial Wastes
   DR. D. GARDNER FOULKE, Sel-Rex Corporation
9. Ohio River Valley Sanitation Commission
   WILLIAM J. NEILL, Columbus Metal Products, Inc.
10. Society for Plastic Engineers
    (To be appointed)
11. Society of Aircraft Materials & Process Engineers (SAMPE)
    MYRON E. BROWNING JR., The Convair Company
12. The Electrochemical Society
    DR. D. G. FOULKE, Sel-Rex Corp.

A. C. Fricke

## STALWART EARNS DALLAS-FORT WORTH BRANCH'S HIGHEST AWARD

A founding father of the AES's Dallas-Fort Worth Branch and its long-time Secretary-Treasurer, A. C. Fricke was awarded that Branch's First Annual Dallas-Fort Worth Branch Achievement Award at a meeting of the Branch held in Dallas, September 21, 1960.

## NEWARK BRANCH CHRISTMAS PARTY PLANS

Plans are complete for the Annual Educational Session and Christmas Party of the Newark Branch, December 16 and 17, at the Robert Treat Hotel in Newark.

The Friday night Educational Session will be preceded by a Dutch Treat dinner at 6:30 p.m. At the meeting, Richard Bikales of Metal and Thermit Corporation, will talk on "Chromium Plating."

The ever-popular Christmas Party will take place on Saturday evening. The local members of the Metal Finishing Suppliers' Association will host a Cocktail Party, 5:30 to 7, followed by the Banquet.

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Don Berry
**WICHITA:**
Homer O. Meserve Jr.

Minute Man statue at Lexington, Massachusetts, commemorating the historic Revolutionary War Battle of April 19, 1775.

# BOSTON BRANCH'S MINUTE MEN READYING HISTORIC BOSTON FOR AES's CONVENTION ADVENT

NINE score and five years ago, Paul Revere, renowned patriot and equally celebrated metal finishing pioneer, sped his mount from Boston to Lexington in the gloom of mid-April's midnight hours to warn the Middlesex villagers that British troops were marching to sieze the military supplies of the Minute Men in Concord.

And nine score and five years later, the Minute Men of the Boston Branch of American Electroplaters' Society (AES) are spreading the impressive message far and wide in AES circles, of the quality 48th Annual Convention of AES that will be staged in Bostontown, June 18-23, 1961, with that AES Branch, itself observing its Fortieth Anniversary, as Host Branch.

Education in the arts and sciences of electroplating, metal finishing, organic coating and allied arts being the paramount business of half-century old AES, its eight Regional Councils and its 59 Branches in the United States, Canada and Australia, stellar billing in the message of the Boston Branch's Minute Men has naturally been assigned to the Boston Convention's nine-session, thirty-paper Educational Sessions Program. And what an educational program is being developed for AES's knowledge-seeking members coming from America's coast-to-coast and border-to-border as well as from abroad!

The Educational Opening Session will feature the third annual "William Blum Lecture", this one to be presented by Dr. Charles L. Faust, Battelle Memorial Institute, 1960 winner of the AES Scientific Achievement Award. To follow will be a Research Session—also an Organic Finishing Session. There will then be a two-session, eight-paper "Finishing of Light Metals" symposium—followed by a "Light Metals Finishing Forum". Some fifteen important papers on other significant elements of plating and metal finishing will then follow as important additional educational fare.

Meantime, for the ladies of AES, there will be thrilling days of AES social events mapped by Ladies' Chairman Marjorie Swift and her Bay City ladies, against the background of modern Boston in a prevalent yet subdued setting of culture, tradition, history. And for the youth of the Society, there will be supervised sightseeing in a region unique in the quantity of its worthwhile educational sights to see and never forget, plus modern New England-grade joy and fun.

There will be an Opening Session long to be remembered if plans materialize as expected. There will be Board and Committee meetings. In "off duty" hours there will be a memorable Clambake—and on other occasions, a visit to the famed Boston Pop Concerts—a golf tournament—many cocktail parties and receptions—finally, a top-notch Farewell Banquet with high-grade professional entertainment.

Plan now to attend the AES's Forty-Eighth Annual Convention. Apart from education, make it a vacation and bring the family. Make a pilgrimage to the shrines of American history and the abundant wonders of Boston and its renowned environs. Boston Branch's Minute Men confidently expect to make your Convention stay worthwhile whether you come "One by land or two by sea" in the paraphrased hallowed and beloved words of Henry Wadsworth Longfellow.

(LEFT) Paul Revere Mall, Boston. Steeple of the "Old North Church" is background for equestrian statue of Paul Revere. (BELOW) Paul Revere's House, built in 1660, is the oldest wooden house in Boston.

# INTERSOCIETY NEWS

### RECORD CHEMICAL SALES FORECAST BY MCA

A record sales year of $28 billion for 1960 for the chemical industry is forecast by Maurice F. Crass Jr., secretary-treasurer of the Manufacturing Chemists' Association, Washington, D. C.

The business outlook for the fourth largest U. S. industry for the remainder of this year and the first half of 1961 is the result of a survey of approximately fifty chemical companies conducted by Crass and Marjorie V. Campbell, assistant to the secretary of the association.

Despite the 9 per cent increase in sales expected this year over 1959's $25.7 billion total, Crass pointed out there is considerable doubt in the industry as to much if any improvement in the profit picture either in the remainder of 1960 or throughout 1961.

♦

### WESTERN METAL CONGRESS CHAIRMAN ANNOUNCED

H. A. Curwen, technical director of Earle M. Jorgensen Co., Los Angeles, has been named convention chairman for the 12th Western Metal Congress, scheduled March 20–24, 1961 in Los Angeles. T. C. DuMond, manager of Metal Congresses for sponsoring American Society for Metals, made the announcement.

Latest report on the 1961 Western Metal Exposition from Chester L. Wells, ASM exposition manager, shows 143 exhibit spaces already reserved, representing products of 191 metal-working firms. The metal show will be staged in Pan-Pacific Auditorium while technical sessions of the metal congress are taking place in the Ambassador Hotel.

Also announced by Mr. DuMond is appointment of key chairmanships on the Western Metal Congress Host Committee, composed of ASM members in Southern California.

♦

### ASM DEDICATES NATIONAL HEADQUARTERS

American Society for Metals on September 14 dedicated its geodesic-domed national headquarters in Geauga County, near Cleveland, with several hundred important leaders from industry, government and scientific circles in attendance.

Highlights of the event were dedication addresses by Dr. Clyde Williams and Dr. Zay Jeffries, and placement of a time capsule containing nearly a pound of uranium metal. Walter Crafts, ASM national president, presided throughout the ceremonies, and presented the building to Allan Ray Putnam, managing director, for "increased dissemination of technical information for constanlty improving technology in metal working."

Dr. Williams, one of the nation's outstanding administrators of science and research, cited the technical society as the "essential link" between science and industry which can do much to meet the threat of Russia, the "corrupter of the spirit of science." Former president and director of Battelle Memorial Institute, Columbus, Ohio, he is now president of his own management consulting firm in that city.

Dr. Jeffries paid tribute to late ASM founder-member W. H. Eisenman by calling for positive steps in fighting the present war with Russia—"cold" war or whatever—by utilizing every technological means at our disposal. He spelled out specific steps that the ASM can take to help *win* the cold war from Russia.

At the conclusion of his address, Dr. Jeffries unveiled a bronze bust of Mr. Eisenman, who had conceived a dramatic building of metals, for ASM national headquarters, and donated the 100 acres on which it stands. Dr. Jeffries, former Case Institute of Technology professor and later head of General Electric's Carboloy subsidiary and chemical department, is now a consultant in Pittsfield, Mass. He founded the Cleveland Chapter, ASM.

Feature of the dedication ceremonies was a time capsule containing nearly a pound of highly radioactive uranium metal. Many documents, books and other materials of the American Society for Metals are included to provide metalworking of a future era with a running account of the progress made up to 1960.

The uranium is encased in a gold-anodized, engraved aluminum capsule donated by the Society's St. Louis Chapter. The uranium itself was provided by Mallinckrodt Nuclear Corp., St. Louis.

A Geiger counter, provided by Victoreen Instrument Co., Cleveland, will detect the presence of the ASM Time Capsule, placed in the entrance plaza at the base of one of the five supporting pylons of the geodesic dome.

♦

### ASTM HAS NEW EXECUTIVE SECRETARY

Thomas A. Marshall Jr., has been elected executive secretary of the American Society for Testing Materials by its Board of Directors. He had been senior assistant secretary of the American Society of Mechanical Engineers.

As executive secretary of ASTM, Mr. Marshall will head a staff which supports a Society of 10,500 members and 6000 additional committee members.

Fred F. Van Atta, formerly assistant secretary of ASTM, was elected to the post of treasurer with responsibility for the business operations of the Society. Robert J. Painter, formerly executive secretary and treasurer, will continue as consultant to the executive secretary. He will be especially concerned with the Society's long-range planning program. Raymond E. Hess will continue as associate executive secretary. As technical secretary and editor-in-chief, Mr. Hess is responsible for the technical activities and publications of the Society.

Mr. Marshall was born in Savannah, Ga., in 1911 and received his early education there. In 1932 he was graduated from Georgia Institute of Technology (then Georgia School of Technology) with a BS degree in Aeronautical Engineering.

From 1932 until 1951, except for five years active duty with the U. S. Navy during World War II, Mr. Marshall was employed in the main office of the Metropolitan Life Insurance Co.

In 1951, Mr. Marshall became executive secretary of the Engineering Manpower Commission which had just been formed by Engineers Joint Council and a year later became secretary of EJC as well.

Mr. Marshall joined the staff of ASME in 1954 to manage the Society's 75th Anniversary Celebration and its public relations activities. In 1956 he was named head of technological service, leading to his appointment as assistant secretary and, later, senior assistant secretary.

Mr. Van Atta has been assistant secretary of ASTM since shortly after joining the staff in 1953. Prior to that, for a year, he was assistant managing director and manager of the Building Division of the Carolinas Branch, Associated General Contractors. From 1946 to 1952, he was assistant secretary of the American Concrete Institute and later acting secretary-treasurer.

♦

### ASTME WESTERN CONFERENCE OPENS NOVEMBER 14

Tailored especially to meet the needs of the fastest growing industrial area in the country, the ASTME Western Engineering Conference and Exhibit at the Los Angeles Memorial Sports Arena, November 14 to 18, will display more than 2000 pieces of production equipment and related items and services.

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**OAKITE COMPOSITION 77—for removing carbonaceous soils and light rust.** Featuring long cleaning life and a steady pH range for best action, Oakite 77 is a heavy duty cleaner which produces excellent results in removing burnt-on soils and light rust bloom.

**OAKITE ALUMINUM CLEANER 164—for non-etch aluminum cleaning.** Completely safe for aluminum, this alkaline material quickly removes identification inks, oils and light shop soils. It's free-rinsing, works well in hard water. Has low foaming tendencies in airagitated tanks.

**OAKITE COMPOSITION 90—for complete magnesium cleaning.** Thoroughly safe for magnesium, Oakite 90 won't react with the metal surface to form insoluble soap films. It cleans completely, rinses off freely.

**OAKITE COMPOSITION 20—for fast removal of medium soils.** When shop soils are only moderately heavy, Oakite 20 emulsifies and suspends them in short order —most economically. An alkaline material, it offers long life and steady cleaning ability.

**OAKITE COMPOSITION 23—for cleaning zinc die castings.** Cleaning action of Oakite 23 avoids dullness under the electroplate found when deep-etching cleaners are used. Oakite 23 rinses film-free, leaves a bright surface that takes a smooth, bright electroplate.

**OAKITE COMPOSITION 27—for non-tarnish cleaning of brass.** Oakite 27 removes smuts and soils from brass and other copper alloys without tarnishing the metal surface . . . leaves parts gleaming bright. Provides the long cleaning life typical of alkaline materials.

**OAKITE COMPOSITION 8—for tough pre-cleaning jobs.** Used with kerosene, Oakite 8 digs into tough, tenacious soils, and heavy grease or oil. By removing the worst deposits prior to alkaline cleaning, Oakite 8 keeps total cleaning time short, cuts overall cleaning cost.

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The exhibits, plant tours, technical sessions, and special events will provide an opportunity for the men who plan, design, and oversee production to exchange ideas to obtain an even greater productivity rate in the west.

In the last decade, California has more than doubled its steel-making capacity. Los Angeles moved from fifth to third among metropolitan areas of the nation in manufacturing employment, and according to the 1960 Dun & Bradstreet Metalworking Directory, leads the nation now in number of machine shops with over 20 employes. It is second only to Chicago's Cook County in large screw machine products plants.

Opening the Western Engineering Conference and Exhibit, Monday, November 14, will be a California Day Luncheon, a tribute to local industry. Keynote speaker will be Maj. Gen. Osmond J. Ritland, Commander, Air Force Ballistic Missile Division, Air Research and Development Command, Los Angeles. The General will speak on "The Air Force Ballistic Missile and Space Program." The luncheon will be held at the Sports Arena beginning at twelve noon.

The exhibit will officially open its doors at 1:00 p.m. on November 14, to reveal more than $5 million worth of production equipment, services, and related items displayed by more than 200 exhibitors from around the nation.

N. A. Vigeant

### VIGEANT NAMED GENERAL CHAIRMAN NAMF CONVENTION

Napoleon A. Vigeant, president of M & V Electroplating Company, Newburyport, Mass., has been named general chairman of the 1961 convention committee of the National Association of Metal Finishers. This announcement was made by NAMF president Robert L. Giesel of Chicago, Ill. Mr. Vigeant, who heads one of Massachusett's largest metal finishing firms, will be responsible for planning and implementing a four-day conclave scheduled to be held in Boston, June 16–19, 1961. Headquarters hotel is the Statler-Hilton.

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TWO BOOKS
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1. The AES book TECHNICAL PROCEEDINGS (1960 Edition) containing the technical papers presented at the AES's 47th Annual Convention, Los Angeles, California, July 24–28, 1960, including the transcript of the discussion that attended the delivery of each paper, plus other features.

2. The book on "Hydrogen Embrittlement in Metal Finishing" edited for AES by Dr. Harold J. Read of Pennsylvania State University.

WATCH PLATING MAGAZINE'S MONTHLY AES BOOK SECTION FOR FURTHER INFORMATION

# INVESTMENTS FOR AES NON-MEMBERS

This issue of PLATING MAGAZINE that you are reading is a typical edition reaching every member in good standing of American Electroplaters' Society, Inc. (AES) monthly, plus a large and growing number of AES non-members internationally who subscribe to it year after year because they like its values. That's why half-century old PLATING serves the largest audited paid circulation in this field and has the highest audited percentage of paid subscription renewals in the electroplating and metal finishing field.

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**NICKEL,** 99 pct plus, rolled carbon per lb . . . **$1.0225**
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**SILVER,** cents per troy oz . . . . . **91.375**

### Chemicals

**BORIC ACID,** 100 lb bag N. Y. . . . . **12.10**

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# INDUSTRY NEWS

### DRESSER ELECTRIC APPOINTS DISTRIBUTORS

Dresser Electric Co., 2705 Wight Street, Detroit, Mich., has appointed several new distributors to handle its complete line of plating rectifiers. Du-Tone Chemical Co., Waukegan, Ill. will represent Dresser in Illinois and Wisconsin; Keystone Plating Supply Co., Detroit, Mich. in Michigan, northern Indiana and Ohio; and Bill Young & Company, Inc., Cincinnati, Ohio in southern Ohio and Indiana, Kentucky and Tennessee.

Donald P. Friedt, Dresser sales manager, stated that the appointment of distributors represents a change in marketing emphasis for the company. Increases in production facilities have made it possible for Dresser Electric Co. to supply a larger number of customers than can be contacted with a direct sales force.

♦

### ENTHONE APPOINTS FRENCH LICENSEE

Enthone, Inc. of New Haven, Connecticut, subsidiary of American Smelting and Refining Co., has announced the licensing of Pernix Grauer & Weil of Paris to manufacture, sell and service Enthone products in France, Belgium, Spain, Portugal and French Overseas Territories.

Pernix Grauer & Weil is one of the largest manufacturers of plating and polishing equipment in France and a supplier of plating chemicals. It maintains extensive research, analytical, and material testing laboratories at its main offices at 76 Boulevard Richard-Lenoir in Paris. Manufacturing facilities are located at La Varenne-Saint-Hilaire near Paris and branch plants are operated in Belgium and Spain. Enthone metal finishing chemicals will be manufactured at all three locations.

This new arrangement is a continuation of Enthone's overseas marketing policy, the purpose of which is to make Enthone products available in foreign countries at low cost through local manufacture. Enthone chemicals are also manufactured in England, Italy, Sweden, West Germany, Brazil, Mexico, and Canada.

♦

### UDYLITE TO PRODUCE PRE-CURED NEOPRENE LINING

The Udylite Corporation has announced a new synthetic rubber lining pre-cured by a radio frequency energy process.

The synthetic rubber lining material is a pre-cured neoprene, marketed by Udylite under the trade designation CPD-10. It has been used successfully in electroplating tanks, chemical storage tanks, feed water tanks, flow tubes, etc.

Frank E. Firth of Milton, Mass., formerly in government service with the Departments of State and the Interior, was named engineering promotion manager, rubber and plastic products, to head the marketing program for CPD-10.

A unique method of pre-curing by radio frequency energy, in combination with a multiple ply, gives a uniformity of cure impossible to obtain by conventional curing methods. The result is such perfect ply adhesion and uniform density of the sheet that pinholes, blisters and trapped air bubbles are entirely obliterated.

Before joining Udylite, Mr. Firth was manager of the Linings Division of Chase & Sons, Inc., of Randolph, Mass. He is a Fellow of the American Institute of Chemists, and a member of the New York Academy of Science, National Association of Corrosion Engineers, American Electroplaters' Society, Chemical Market Research Association, American Ordnance Association and the American Boat & Yacht Council.

A graduate of Harvard University (Class of 1936), Mr. Firth is co-author of "Marine Products of Commerce," and author of 22 scientific, technical and general articles published in national magazines.

♦

### ROTO-FINISH TO MANUFACTURE HARPERIZER FINISHING MACHINE

The Roto-Finish Company, Kalamazoo, Mich. has been appointed manufacturing licensee of the new "Harperizer" finishing machine. The machine is designed to produce a superior finish to parts with intricate detail, ornamentation, or complex shape. Using a fine loose abrasive, the Harperizer utilizes a high centrifugal force which holds parts and media together in a tight mass. Processing time is short. No fixtures or buffs are necessary.

Parts which can be processed in the "Harperizer" range from watch screws to automobile headlamps. The rate of production is high on such parts as cams (from 80 to 18 micro-inch finish without distortion), stainless steel flatware, golf clubs, brass plumbing fixtures, and molded plastics.

♦

### FENN TO MANUFACTURE NEW DEBURRING MACHINE

Wilson L. Fenn, president of The Fenn Manufacturing Company, Newington, Conn., manufacturers of metal forming machinery, has announced the purchase of The Liquid Wheel Machine Company of Indianapolis, Indiana and with it sole rights to manufacture a patented machine for deburring metal parts.

At present only a prototype machine has been built. However, much interest in the machine has been shown by automotive and other major industries. Mr. Fenn stated that prior to actual production and marketing, the machine will be rede-

Frederick Gumm Chemical Company, Kearny, N. J., held its Fall Sales Meeting, September 7–9, at the Robert Treat Hotel, Newark, N. J. Their newly-designed trademark was unveiled and sales policies for the forthcoming year were discussed. Many new products for metal cleaning, barrel finishing and aluminum treating operations were introduced. In attendance were, seated left to right, A. S. Kohler, technical director; C. Clark; J. M. Barry; R. R. Sizelove, vice president; J. R. Gumm, president; H. F. Martin, sales manager; E. Herzig, E. S. Jevely, S. Boyar. Standing, left to right, A. Fusco, J. Vallone, E. Psyck, V. L. Casswell, J. C. Barry, R. McDowell, S. Fuhr, H. Hatley, D. Gumm.

signed to Fenn standards and several important basic improvements will be incorporated.

The machine was invented by R. O. Brown and Alfred B. Hollingsworth, the latter deceased, of Indianapolis. When Mr. Brown retired, after many years in the manufacturing divisions of General Motors, he reflected upon the number of times that it was necessary to put thousands of parts through expensive deburring, polishing and burnishing operations. He recalled that since his boyhood, on a farm, he had noted when a plow was pulled through fields, at the completion of a day's activity it had an extremely polished surface and that any niches, scratches, or burrs had been removed. He, therefore, determined that if it were possible to pull a metal part to be deburred through the earth at a given speed, he was certain all burrs would be removed. Realizing the impracticability of this, it then occurred to him that if he could hold metal parts in a fixture and the earth or an abrasive material moved by the piece the same result might be achieved. The prototype machine has been developed around this basic and patented process. Mr. Brown has been retained by Fenn for consultation and further development of the machine and will move to the Hartford area soon.

♦

### WIRE OUTPUT DOUBLED AT NATIONAL-STANDARD

New continuous plating equipment has been installed here by National-Standard Co. of Niles, Mich. to double its production capacity for Copperply copper-plated steel wire, according to Richard W. Elder, vice president. This is the second doubling of production capacity in a year and the fourth doubling since Copperply was introduced three years ago, he added.

One of the newer and most promising applications, Mr. Elder said, are springs and wire forms made of Copperply where the elasticity of high-tensile steel is desired along with electrical conductivity.

♦

### WESTINGHOUSE APPOINTS ULTRASONIC CLEANING DISTRIBUTOR

Production Methods Company of 2941 Touhy Avenue Chicago, Ill., has been appointed distributor in Illinois, Wisconsin and in Northwestern Indiana for Westinghouse ultrasonic cleaning equipment, Westinghouse Electric Corporation has announced.

The Chicago firm headed by Marvin Klein, is a distributor of metal cleaning and finishing equipment. It will handle all lines of Westinghouse ultrasonic cleaning equipment, produced at the company's X-ray and Industrial Electronics Division in Baltimore, Md.

### BATTELLE UNDERTAKES FUEL CELL RESEARCH

A long-term research program to advance fuel-cell technology, described as "a major research effort being underwritten by some 25 companies," has just begun at Battelle Memorial Institute, Columbus, Ohio.

The program, presently on a five-year schedule, "will be fundamental in nature and is designed to complement existing government, industrial, and academic studies on fuel cell technology," according to Dr. John McCallum, project director. "Before the fuel cell's full potential can be realized as a source of power for automobiles, domestic heating and cooling, and industrial processes," he said, "there will have to be a number of inventions, innovations, and breakthroughs. Battelle, with its diversity of scientific disciplines, hopes to contribute to this process of discovery."

The fuel cell—an electrochemical device that converts chemical energy directly into electrical energy—has often been compared with a storage battery or dry cell. Like a battery, the fuel cell produces electricity by a chemical reaction. Unlike a battery, the fuel cell operates like an engine in that it continues to produce electricity as long as fuel is added. A conventional battery, which depends solely upon the chemicals "built" into it, must be recharged electrically as it "runs down".

Extended service is only one of many advantages ascribed to the fuel cell as a source of energy. The prime advantage is the remarkable efficiency with which a fuel cell can convert fuel to energy. Efficiencies of 75 per cent have been demonstrated in experimental fuel cells, as compared with 40 per cent in steam turbines,


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35 per cent in Diesels, and 25 per cent in spark-ignition engines. Similarly, the fuel cell offers an attractive energy-to-weight ratio. Because the cell, itself, contains no moving parts, it is simple in design, can be built to meet specific space and shape requirements, and requires a minimum of mechanical maintenance. In operation, the fuel cell is silent, and it gives off no objectionable waste products. While present interest centers on a cell using a mixture of hydrogen and oxygen as its fuel, scientists believe cells can be built to use a wide variety of fuels, including petroleum products.

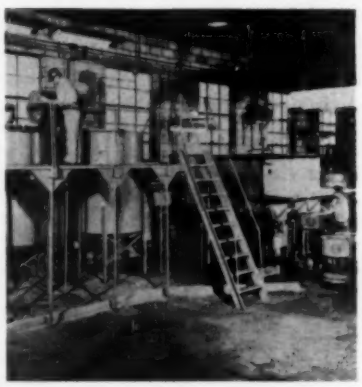
An approach to be employed in the Battelle program is the study of thin films of metals. Thickness of such films greatly affects their properties. A better knowledge of these properties may be a significant factor in the selection of the right combination of materials for more efficient fuel cells.

Other phases of the research program will include study of active carbon electrodes with metal-chelate surfaces and the use of unusual plating techniques to apply porous mental surfaces to electroformed electrodes for the cell. Concurrent with the experimental work, Battelle will collect and interpret new data on fuel cells for the use of participating companies. It will draw information from all available sources.

The new fuel-cell program will require the specialized research skills of Battelle chemists, chemical engineers, mechanical engineers, mathematicians, metallurgists, and physicists. Among the key members of this team will be Dr. Charles L. Faust, past president of the Electrochemical Society, who will supervise electrochemical studies; Dr. Leslie D. McGraw, who will assist him; and Dr. Louis J. Hillenbrand, who will conduct studies on catalysts to promote the electrode reactions.

## H-VW-M INCREASES CAPACITY OF GRAND RAPIDS PLANT

J. C. Miller Division, Hanson-Van Winkle-Munning Company has completed expansion of the H-VW-M manufacturing facility in Grand Rapids, Mich. By the addition of reactors, filtration equipment and mixing equipment, the company has increased the monthly production capacity of the plant by a factor of three. H-VW-M management considered the expansion necessary to meet the rising demand for the Company's recently enlarged line of proprietary and other chemicals for electroplating and other metal-finishing.



The new Grand Rapids facility went into limited production May 1 and by June 1 had tripled the Grand Rapids production capacity.

Grand Rapids has also been established as a new shipping point for nickel anodes. Complete processing operations are conducted at this plant insuring prompt delivery. In addition to its expanded facilities and anode processing operations at Grand Rapids, H-VW-M continues to maintain an even larger installation at Matawan.

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# INDUSTRY NEWS BRIEFS

### COMPANY NAME OF AMERICAN BRASS CHANGED

The American Brass Company officially changed its name to Anaconda American Brass Company on October 3.

A wholly owned subsidiary of The Anaconda Company, Anaconda American Brass Company will continue to have its headquarters in Waterbury, Conn. with mill operations in Ansonia, Torrington and Waterbury, Conn.; Buffalo, N. Y.; Detroit, Mich.; Kenosha, Wis.; Paramount, Calif.; and Mattoon, Ill. The Canadian subsidiary of Anaconda American Brass Company is Anaconda American Brass Ltd., and is located in New Toronto, Ont.

♦

### ENGLEHARD INDUSTRIES LISTED ON STOCK EXCHANGE

Engelhard Industries, Inc. is now listed on the New York Stock Exchange under the symbol ENG. The company, whose shares were first offered to the public in June, is the world's largest refiner and fabricator of platinum metals and is also a major manufacturer of industrial products containing platinum and other precious metals.

A brief ceremony took place at 10:00 o'clock on the morning of September 7 on the floor of the Exchange and was attended by Charles W. Engelhard, board chairman and president of the firm, Edward C. Gray, executive vice president of the New York Stock Exchange, Bertram F. Fagenson, specialist in the stock, and other executives of Engelhard Industries.

♦

### DISTRIBUTOR NAMED FOR AMERICAN ZINC FILMS

American Zinc Institute will promote the distribution of its educational motion pictures: "Die Casting: How Else Would You Make It" and "Zinc Controls Corrosion."

The services of Modern Talking Picture Service, Inc., 3 East 54th Street, New York City, have been engaged to promote the Institute's films and receive and service booking requests from viewers.

Both the Institute films: "Die Casting: How Else Would You Make It" and "Zinc Controls Corrosion" are 16-mm, sound and color motion pictures, available without cost to industrial organizations, schools, colleges, technical groups and clubs of all kinds. The corrosion film has a running time of 38 minutes, and the die casting film takes 35 minutes.

♦

### HAMPDEN CHEMICAL DISTRIBUTOR FOR DANIELS BARRELS

The Daniels Plating Barrel and Supply Co., manufacturers of Newark, New Jersey, have appointed Hampden Chemical & Equipment Co., of Philadelphia, Pa. as its distributor for the distribution of a complete line of the Daniel's oblique and portable plating barrel units.

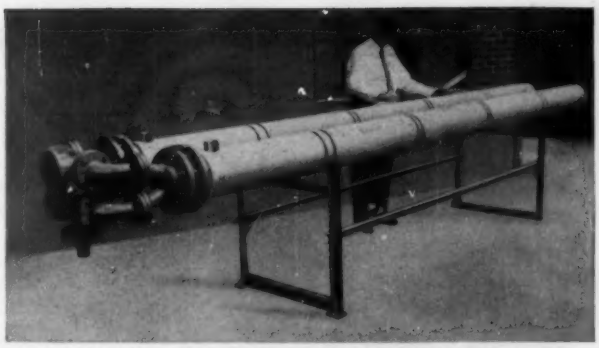
♦

### BECK EQUIPMENT HAS NEW NAME

Effective October 1, Beck Equipment Co. changed its name to Beck Equipment & Chemical Co. The new name better describes the expanded line of chemical products, processes and services offered by this 14-year old company.

Beck manufactures and formulates a line of chemical paint removers which strip off everything from epoxies to carbon without corroding magnesium or aluminum, also accelerators for continuous hot or cold stripping.

The plant, offices and laboratory of Beck Equipment & Chemical Co. are located at 3350 West 137th Street, Cleveland 11, Ohio.

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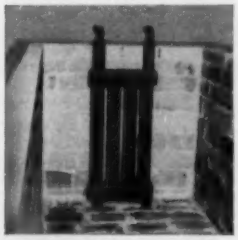

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**Electroplating and Metal Finishing**
15 Udney Park Rd.
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**Metal Progress**
American Society for Metals
Metals Park
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**J. Electrochemical Society**
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**Plating Management**
11 Park Street
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### FUTURE MEETINGS

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DR. D. GARDNER FOULKE
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**Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.**

**2,941,929, 6/21/60—ELECTROLYTES**—J. E. Lilienfeld, assignor to S. D. Warren and R. F. Burkard, Arlington, Mass.

A non-aqueous electrolyte for anodizing metals is composed of an organic aldehyde (4–7 carbon atoms) as a solvent and binary solute composed of a weak acid of the hydroxy benzene class and an alkali metal compound.

10 claims.

**2,941,930, 6/21/60—DECORATIVE ALUMINUM SURFACE**—N. Mostovych and W. Mitchell, assignors to Reynolds Metals Co., Richmond, Va.

Dead-soft aluminum is recrystallized at 600–1500F to develop large crystals, the aluminum is then etched and anodized, yielding a pattern.

12 claims, figure.

**2,942,954, 6/28/60—ETCHING SOLUTION**—A. B. Thomas, assignor to General Motors Corp., Detroit, Michigan.

A persulfate (68 g/l up)-fluoride (13 g/l up) etching solution for titanium is claimed.

4 claims.

**2,942,955, 6/28/60—ALUMINUM ETCHING**—A. Hannah, Wyandotte Chemical Corp., Wyandotte, Michigan

A caustic etchant is described as containing in addition to the alkali a scale inhibitor (a polyhydroxy organic compound, a number mentioned) and an accelerator such as sodium or potassium chromate.

9 claims.

**2,942,956, 6/28/60—ALUMINUM BRIGHTENER**—D. R. Kelly, assignor to Wyandotte Chemicals Corp., Wyandotte, Michigan.

A composition to be added to water to make an aluminum

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brightening solution contains an acid fluoride salt (10–25 per cent), a water soluble organic acid (20–50 per cent) with a $K_1$ of $1 \times 10^{-4}$ to $2 \times 10^{-3}$, methyl-cellulose (15–30 per cent) and a wetting agent (10–30 per cent). The above is added to water in the amount of 2.8 to 9.0 per cent.

18 claims.

**2,942,999, 6/28/60—TEST FOR BRAZEABILITY**—E. J. Roehl and E. B. Michel, assignors to Pittsburgh Steel Co., Pittsburgh, Pa.

The brazeability of copper plated strip steel is determined by stopping off the copper, then immersing in a salt solution for a short time after which an immersion copper is deposited on the specimen. Comparing the immersion copper deposit with a test rating is used to determine the brazeability.

2 claims.

**2,943,426—7/5/60—BUFFING WHEEL**—C. Schlegel, assignor to Schlegel Mfg. Co., Rochester, N. Y.

A buffing wheel consisting of a plurality of superimposed helically wound layers of fabric is described.

6 claims, figure.

**2,944,026—7/5/60—ELECTROLYTES**—P. Robinson, assignor to Sprague Electric Co., North Adams, Massachusetts.

Capacitor electrolytes of aniline—maleic acid or heptafluorobutyric acid—triethanolamine adduct dissolved in glycols and nitriles are described.

1 claim.

**2,944,879—7/12/60—LAPPING COMPOUNDS**—L. Allen and D. Woodward, assignors to Kenmore Research Co., Framingham, Mass.

The lapping compounds contain 1–20 per cent of an organophilic clay, 5–40 per cent of abrasive (80 grit to 1 micron) and low boiling kerosene hydrocarbons.

See also 2,944,880 specifying zirconium silicide as the abrasive in 8 claims and figure.

5 claims.

**2,944,919—7/12/60—PROTECTIVE COATING**—L. Morris and F. Lombardo, assignors to Amercoat Corp., Los Angeles, California.

Coat steel articles with finely divided Al. Zn. Mg. Mn, or Ti in red lead or Ca, Mg and Zn peroxides and after dry cure with an aqueous solution of polyvalent metal salt having a red or potential equal or greater than the finely divided metal.

12 claims.

**2,944,925—7/12/60—GALVANIZING**—C. Lynch, assignor to U. S. Steel Corp., New Jersey.

A method for hot dip galvanizing pipe, including a blow-out of the pipe, is claimed.

2 claims, figure.

**2,944,945—7/12/60—ELECTROPLATING**—P. Allison, assignor to General Motors Corp., Detroit, Michigan.

A method for electroplating bearing shells is claimed.

See also 2,944,947 (H. Luechauer to General Motors) describing a continuous method for plating semicylindrical bearings with 11 claims and a figure.

1 claim, figure.

**2,944,953—7/12/60—PLATING MACHINE**—D. Borodin, assignor to Wagner Brothers, Inc., Detroit, Michigan.

An improved plating machine is described fitted with auxiliary anode means.

18 claims, figure.

ANOTHER NORTON PRODUCT

# Why switch to resin-bonded belts?

*You have at least two good reasons for switching to Behr-Manning resin-bonded abrasive belts:*

**1.** They give you the benefit of cooler cutting through heat resistance in every step from roughing thru polishing, with minimum loading or shedding.

**2.** They give you the advantage of lasting much longer than glue-bond belts, easily justifying by production savings, their slightly higher initial cost.

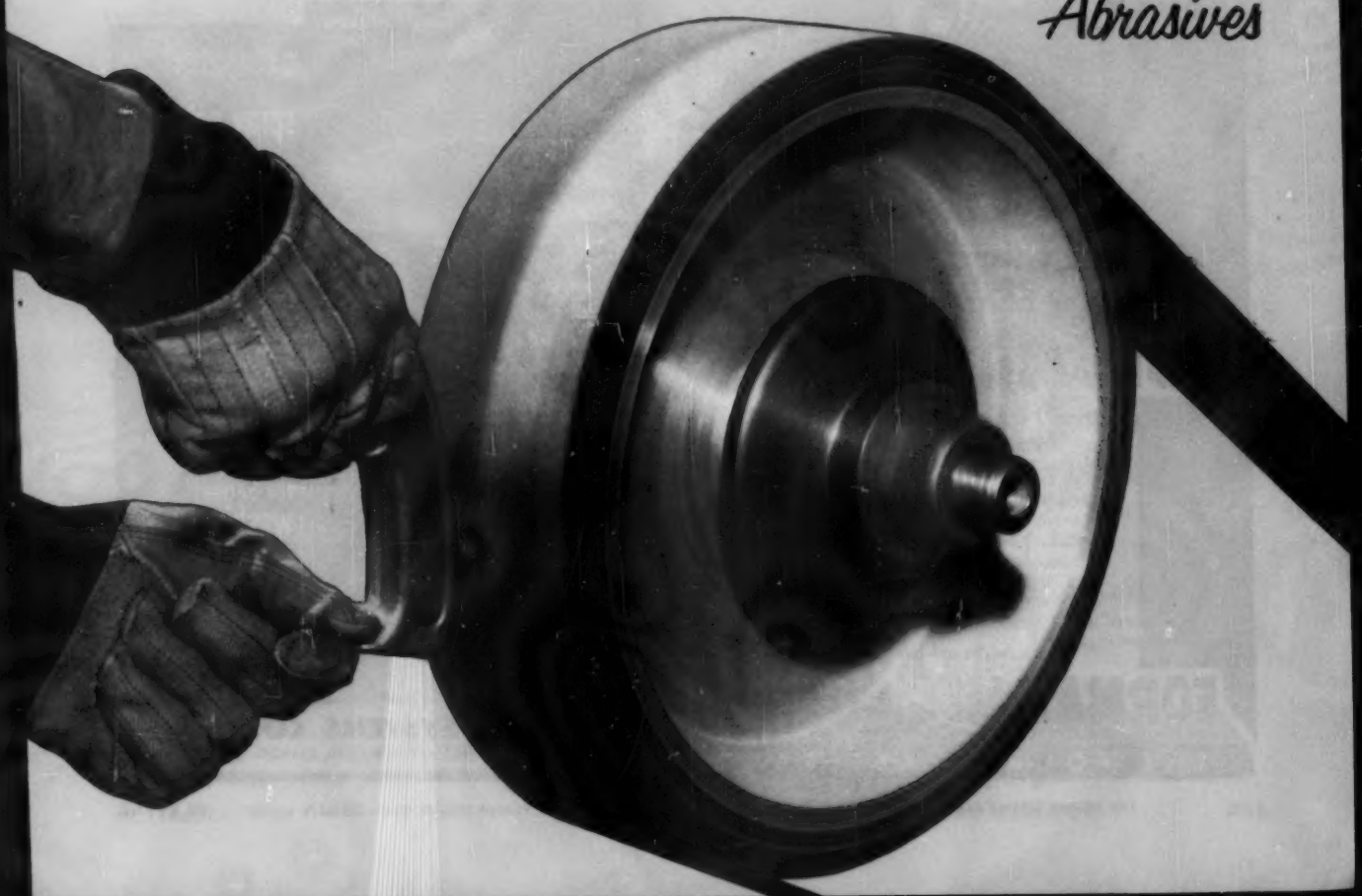
*There are two principal types of Behr-Manning resin-bonded abrasive belts:*

**RESINALL®** . . . an all resin-bonded, aggressive belt of strong X-weight cloth, for maximum heat resistance in most all rough and intermediate grinding.

**RESINIZED®** . . . a resin-over-glue belt of good heat resistance, in strong X-weight for flat polishing, and in flexible J-weight for contour polishing.

Prove the advantages yourself. Ask for an in-plant test. Write Dept. PL-11, BEHR-MANNING Co., Troy, N. Y., a division of Norton Company.

BEAR BRAND Abrasives



# TRADE LITERATURE

**L—1101. NICKEL STRIPPER**—Enstrip S-60, a ready-to-use stripper for nickel and other metals, has been introduced by Enthone, Inc. of New Haven, Conn., subsidiary of American Smelting and Refining Co. It is a free-flowing, readily soluble powder which need only be added to water at room temperature to make a solution which will strip nickel from steel.

Enstrip S-60 contains all of the ingredients, including sodium cyanide, which are required for effective stripping. Separate additions of cyanide eggs or bricks, which dissolve slowly, are eliminated. A saving in time and labor is thus realized.

Enstrip S-60 is used at a concentration of 20 oz/gal. The nickel plate is chemically dissolved, and no electric current is required. In addition to nickel, Enstrip S-60 also strips copper, brass, cadmium, zinc and silver from steel, most iron alloys and magnesium without attack of the basis metal.

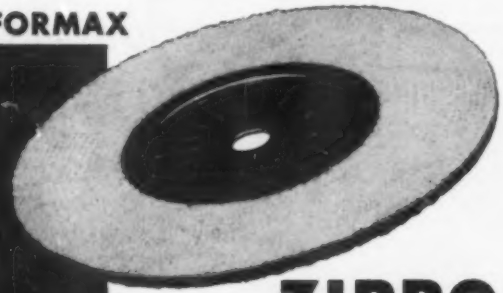
Stripping is usually performed at room temperature in which case the work can be allowed to remain in the stripping tank overnight. Although the work soaks for several hours after stripping is complete, it is claimed that there is no attack on most steel alloys. For faster stripping, temperatures as high as 170F may be used. Nickel is removed at a rate of 0.002 in. per hour at 140–170F, and brass at a rate of 0.003 in./hr at 140/150F. Plain steel tanks or drums are suitable for holding the stripping solution. Literature on Enstrip S-60 is available.

**L—1102. VACUUM COATING**—Custom vacuum coating services for functional and unusual decorative purposes are the subject of a new 4-page brochure just issued by Poly-Kote, Inc. Described are coatings for abrasion, corrosion, and high temperature resistance, as well as unusual electronic effects. Also mentioned are special processes for decorating materials —such as polyethylene—which do not readily lend themselves to conventional coating techniques.

**L—1103. POLISHING MACHINES**—A new 4-page, two color, 8½ by 11 in. illustrated catalog describing a complete line of flat surface grinding and polishing machines for finishing and deburring parts such as: sheets, bars, strips, coils, printed circuit boards, stampings, die castings and sand castings is now available from Acme Manufacturing Co.

The flat surface grinding and polishing machines described in the catalog include: a conveyor belt type machine, designated model KC, for high production grinding, polishing or deburring of miscellaneous shaped parts having flat surfaces; a pinch roll type machine, designated as model KP, for high production finishing of sheet, coil, bar stock, square or rectangular tubing and extrusions; a low cost high production grinder and polisher, designated as model JC, available with conveyor or for use with rotary tables; a high production pinch roll type machine, designated as model FSP, for polishing extra wide sheet, coil or bar stock; and a model V machine for simultaneous polishing of


FORMAX



ZIPPO
SISAL BUFFS

*A Dual-Purpose Polishing and Buffing Wheel!*

Call for Zippo Sisal Buffs when you have need for a fast cutting, heavy duty wheel to remove surface imperfections from ferrous metals. You will find they serve excellently to blend and smooth stretcher strains, orange peel, light die marks and polishing wheel grit lines. And—at the same time leave a bright surface finish.

*Write for Descriptive Literature*

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

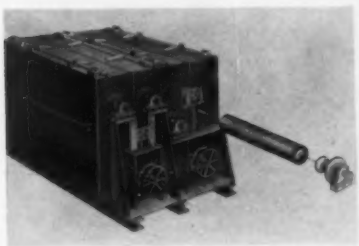
HOLLOW CONE
in complete choice of spray patterns and capacities
CONTROLLED-FLOW*
SPRAY NOZZLES
*exact control of pattern, impact, volume and distribution for any liquid at any pressure.
FLAT SPRAY
FULL CONE
for better washing coating and rinsing
for complete information write for catalog NO. 24

SPRAYING SYSTEMS CO.
3227 RANDOLPH STREET • BELLWOOD, ILLINOIS

both sides of tapered or flat parts. A complete list of specifications for each machine is included in a handy chart form.

Six other types of abrasive belt finishing machines are also illustrated and described.

**L—1104 STRIP MILL SCRUBBERS**—Hanson-Van Winkle-Munning Co. announces the availability of a two-page, two-color bulletin No. SU-100 illustrating and describing various types of strip mill scrubbing equipment.



Particular emphasis is given to the exclusive H-VW-M quick-change brush feature, U. S. Patent No. 2,543,657. This feature allows scrubber brushes to be changed in ten minutes, a process which takes five to six times longer using other equipment.

Also described are the two-brush, two-backup sheet scrubber, the two-brush, two-backup plating line scrubber, four-brush, four-backup coating line scrubber and the four-brush, two-backup cleaning line scrubber.

**L—1105. VACUUM COATING**—A 28-page booklet has been published by Consolidated Vacuum Corp. entitled "Vacuum Coating and Equipment." It describes the vacuum coating process, picturing the complete production cycle, and supplies details of the various units of equipment.

**L—1106. THICKNESS TESTING**—A new brochure entitled "Modern Thickness Testing" has just been published by Twin City Testing Corp. Included as part of this study is an informative description of the various non-destructive methods currently employed for measuring the thicknesses of organic and non-magnetic metal coatings (including phosphate) on iron and steel. The advantages and limitations of each method are thoroughly discussed in light of thickness mensuring instruments now available.

Copies of this brochure and as well as illustrated literature covering Twin City's new Type ES Permascope thickness tester can be obtained without charge.


**FOR LASTING BRIGHTNESS**

on both copper and brass without noxious fuming.

**FOR ALUMINUM**

where the surface hardness of anodizing is not required.

**FOR DIE CASTINGS**

uniform, low-cost finish ideal for later painting.

**BRIGHT AND RIGHT for any job**

**Luster-on®**

**the Economical Chromate Conversion Coatings**

**FOR BRILLIANT, CORROSION-RESISTANT FINISHES**

rivaling chrome for many applications where cost is a factor . . . long-lasting easily controlled applications.

**FOR DECORATIVE COLOR**

on economical zinc . . . scintillating golds, yellows, blues, greens, violets, reds, brass and copper hues.

**FOR CLEAR AND IRIDESCENT COATINGS**

most attractive appearance where corrosion protection, humidity, handling are involved during processing . . . at extremely low cost.

**Luster-On proved process guarantees excellent operating control**

The Chemical Corporation

57 Waltham Avenue, Springfield 9, Mass.

*Canadian Licensee:* Alloycraft, Ltd. Montreal

*West Coast:* Crown Chem. & Engr. Los Angeles & San Francisco

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1141.

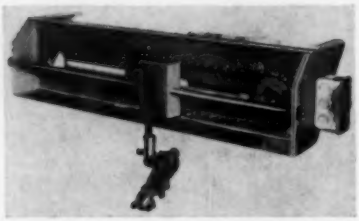
# EQUIPMENT AND SUPPLIES

**E—1101. PLATING BARREL**—A new plating barrel design that is claimed to result in up to 48 per cent greater plating efficiency, is announced by Imperial Industries, Inc.

It utilizes an exclusive "fin" design for automatic plating barrels in a wide range of sizes, materials, and models, according to the announcement.

In actual tests against standard plastisol-coated steel plating barrels, the Imperial all-plastic barrel with "fin" design increased plating thickness up to 48 per cent, Mr. Lewellen reports. The secret is reduced electrical resistance and more thorough agitation and uniform circulation of the plating solution, he explains.

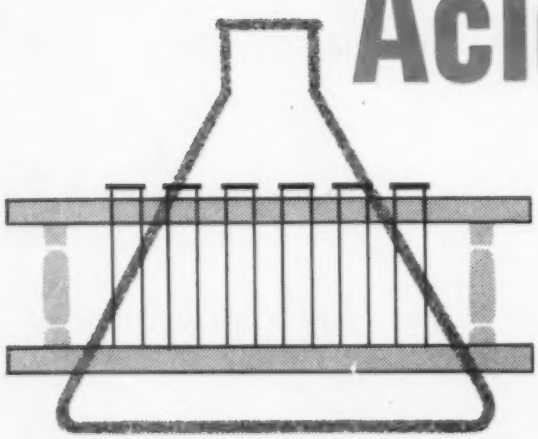
Imperial makes the oblique barrel in polypropylene. The firm also makes the barrel in their own, new Copolefin, a special olefin copolymer. Features claimed of the barrels, which are 100 per cent interchangeable with standard barrels on automatic plating machines, include: Sturdy, all-welded and reinforced construction; resistance to chemicals, stress, impact, abrasion, and heat; long service life; lightweight; and low cost. They stand up under all solutions and temperatures normally encountered in the plating process.



**E—1102. LIQUID COMPOUND APPLICATOR**—A new automatic applicator of liquid buffing and polishing compositions is now being marketed by the Metal Finishing Division of Frederic B. Stevens, Inc.

Known as the Stevens Traveling Gun Mover, this new mechanism is designed for use with wide buffs where the application of a uniform spray of liquid compound is a problem. It is designed to improve liquid compound adherence which will result in cleaner, faster and more economical buffing and polishing operations.


# Fluoboric Acid and METALLIC FLUOBORATES by HARSTAN



HARSTAN now offers high speed fluoborate plating baths to the industry, which produces top quality plating at the lowest cost possible. The many uses for these fluoborates include electroplating, electroforming, solder plating, printing of circuits, tinning of wire and manufacturing of records.

A few of the numerous metallic fluoborates available are lead-tin (solder bath) lead, tin, copper, nickel, and many others. The fluoborates come in a liquid concentrate solution, they allow simple maintenance, and have excellent covering power . . . all adding up to superior plating results.

For complete information on all the fluoborates write for our free literature and samples or direct your specific problem to our technical staff at no obligation.

**HARSTAN CHEMICAL CORP.**
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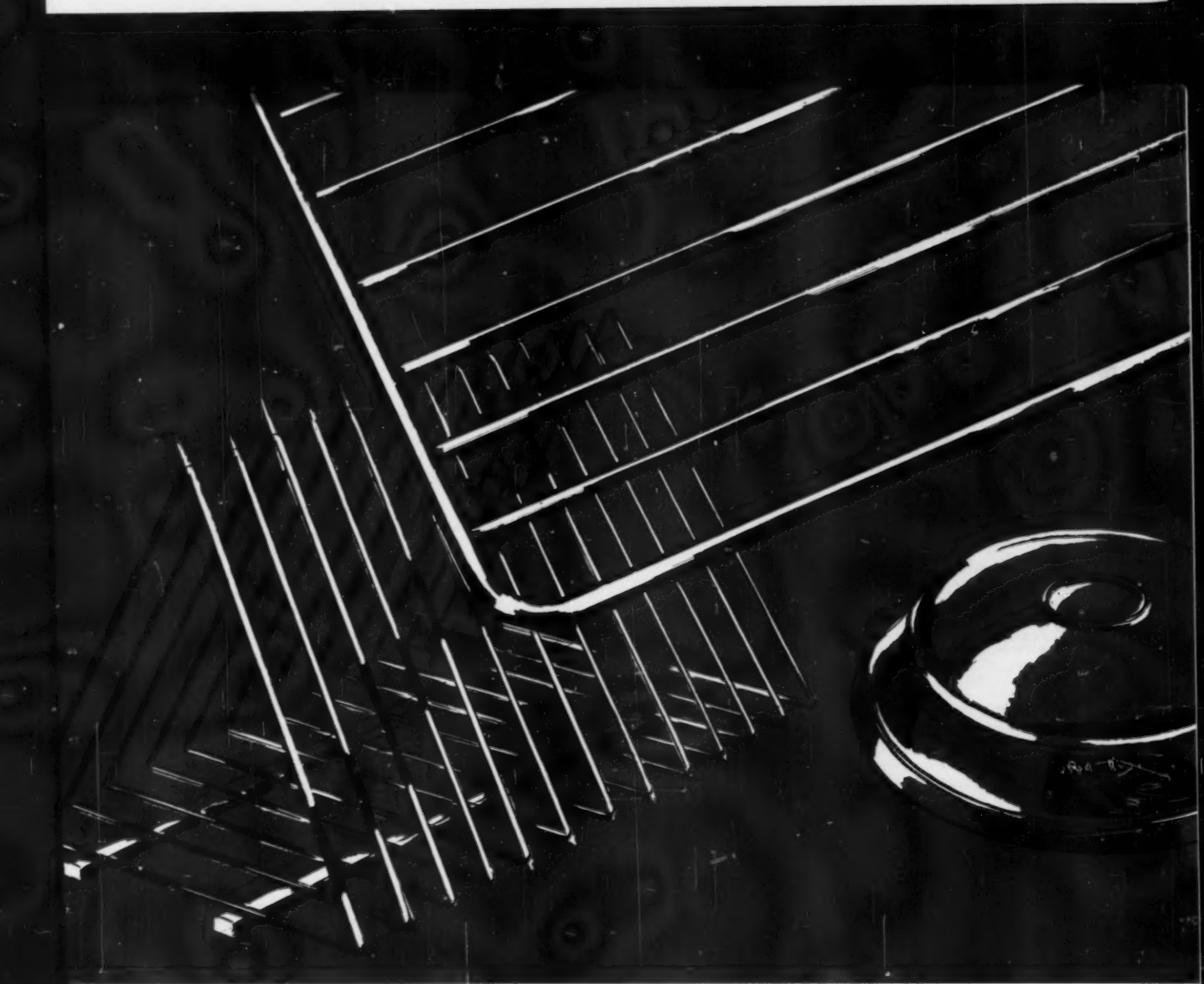
BRITE DIPS • CARBON REMOVERS • RUST REMOVERS • SOLVENTS • PLATING CHEMICALS & EQUIPMENT



# Now add colorful protection to zinc with economical M&T chromate finishes

YOUR choice of color in chromate finishes becomes still wider. Lustrous metallic tints of red, blue, green, gold and purple join the clear, black and yellow iridescent Unichrome* Dip finishes previously available to finish zinc and "beef up" its corrosion resistance.

The added eye appeal you see at a glance. The extra protection has tested out to be one of the highest among dyed chromate finishes.

All Unichrome Dips react chemically with the zinc surface, rendering it passive, and turning it into an excellent "primer" for lacquer or baked synthetic topcoats. Such a combination finish compares in quality with more costly finishes . . . as proved by use for years on wire products, refrigerator shelves, hardware and wheelgoods.

Typical cost of material for a Unichrome Dip Finish comes to just a fraction of a cent per square foot of surface being treated. Write for the new Unichrome Pick-a-Dip Chart or ask the M&T plating engineer for the details.

*M&T's registered trademark

A finishing system consisting of zinc plate, Unichrome Dip Finish and Unichrome Clear Enamel has been in use for almost 15 years on refrigerator shelves made from ordinary steel. And for the best of reasons. It cuts costs, yet gives quality unmatched even by more costly materials.

**plating products**
METAL & THERMIT CORPORATION
General Offices: Rahway, New Jersey
In Canada: M&T Products of Canada Ltd., Rexdale, Ontario

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1143.

Save More
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**Select from one of the nation's largest stocks of guaranteed rebuilt electroplating motor generator sets and rectifiers with full control equipment.**

**PLATERS**

1—10000/5000 AMPERE, 6/12 V. 40° C. **CHANDEYSSON** Synch.
1—7500/3750 AMPERE, 9/18 VOLT. **H-VW-M**, Synch. 40° C.
1—6000/3000 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS**, Synch.
1—5000/2500 AMPERE, 12/24 VOLT **CHANDEYSSON**, Synch
1—5000/2500 AMP., 9/18 V., 40° C., **CHANDEYSSON**, Synch.
1—5000/2500 AMPERE, 6/12 VOLT, 25°C. **CHANDEYSSON**, Synch.
1—4000/2000 Amp., 12/24 V. **CHANDEYSSON** 40° C. Synch.
1—4000/2000 AMPERE, 6/12 VOLT' **H-VW-M**, Synch.
1—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON**. Synch.
1—2000/1000 AMPERE, 6/12 VOLT, **H-VW-M**. Synch.

**ANODIZERS**

1—1000 AMPERE, 40 VOLT, **CHANDEYSSON**, 25°C. and other sizes in stock for immediate delivery; write for details

**RECTIFIERS**

1—**H-VW-M** Selenium 5000 Amp., 6 V. S.C.F.C. 440/3/60.
3—**H-VW-M** Selenium 3000 Amp., 6 V. S.C.F.C. 440/3/60.
1—**NEW G. E.** 2000/1000 AMPS., 6/12 V. Remote Control 440/3/60 AC.
1—**RAPID** Selenium, 1500 Amp., 6 V. SCFC, 220/3/60.
2—**RAPID**—1500 Amp. Periodic reversers.
3—**RAPID** 500 Amp. Periodic Reversers.

**SPECIAL**

2—**CROWN** Centrifugal Driers No. 1 with Heat.
1—R100 **RONCI** Enameler.
3—**LASALCO** Ball Burnishers, No. 1, 2 & 4, Lined or Unlined.
10—Buffing Lathes—**HAMMOND, DIVINE, U. S.**, etc., from 3 H.P. to 20 H.P. Single & variable speed.
2—**INDUSTRIAL** RDR-1 & 2 Rubber Lined Filters, Sizes 10x28, 14x36.
2—**INDUSTRIAL** Type SC Filters for Cyanide. 18x48 and 18x36.
1—**PRODUCTION** Model A pipe polisher with feed troughs.
3—**PRODUCTION** No. 101 pipe polishers. Individual or in tandem
1—**HAMMOND** pipe polisher.
3—**STEVEN BADER** Belt Polishers
3—**AMERICAN** Blower type HS fans. Size 330-10.
8—**DUSKOP** Dust Collector Cabinets. Sizes No. 550, No. 850.
1—Model A **NIEHAUS** steel fume separator.
1—NEW Model B **NIEHAUS** S. S. fume separator.
1—**H-VW-M Munning-** Type (Mechanical lift), Full Automatic, Plating Machine 70' long x 4' wide x 36" deep x 10½' overall height.
1—**CROWN** 48 x 36, 2 compartment horizontal tumbling barrel lined or unlined.
5—**MERCIL** Nickel plating barrels 12" x 36" with R. L. tanks.
3—**DANIELS**—30LS plating bbls.
1—**ACME** L8L Semi-Automatic buffing machine. 8 spindles with 2 7½ HP heads.

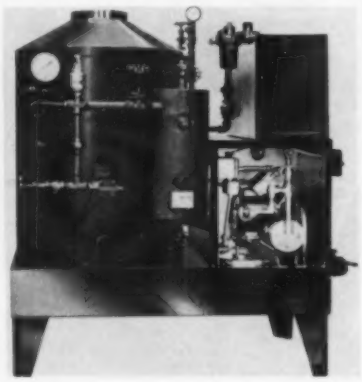
**Other outstanding values in stock.**

**M. E. BAKER CO.**
Kirkland 7-5460
25 Wheeler St., Cambridge 38, Mass.

It is said to be a simple, maintenance-free mechanism featuring a power drive chain and sprocket device. It permits a wide variation in width of travel and can be used with single or multiple buffing systems.

**E—1103. STEAM GENERATORS**—Flash-type, continuous-coil steam generators, capable of producing live steam in 2 to 3 minutes from a cold start, now are being made in 5, 10, 15 and 30 bhp sizes for plating shops, by Malsbary Manufacturing Co.

Each is a complete package, so compact it can be installed near the point of use. For example, the 15 bhp size requires only 30 by 48 in. of floor space—less than an office desk—and weighs only 1300 lbs. Installation requires no special foundations,



walled-in areas or special insulation; user simply connects steam generator to water, fuel and electricity. Flash-type, continuous-coil produces quick steam without a boiler and is as safe as a home hot water heater; burner operates only when steam is needed.

All are designed for use singly or in multiples, thus enabling the user to start with one unit and add others as his plant grows.

**E—1104. CONVERSION COATING**—A new compound for applying a chromate film to aluminum surfaces for protection against corrosion has been announced by The Diversey Corp. The compound, called Divercoat 2-A, conforms to MIL-C-5541 specifications covering immersion coatings. It may be used as a base for paint coatings or for decorative purposes.

Chromate conversion coatings are produced with Divercoat 2-A by immersing aluminum work for a short time in a solution of 1 to 3 oz/gal at room temperature.

Depending on the alloy processed and operating conditions, the resultant conversion coating ranges in color from iridescent yellow to light gold. Tightly adherent coatings are produced easily on all aluminum alloys.

**E—1105. DIE CAST ELECTRO-CLEANER**—Clepo 50-ZB, a unique development for use in cleaning and conditioning zinc diecastings has recently been announced by the Frederick Gumm Chemical Co. Inc.

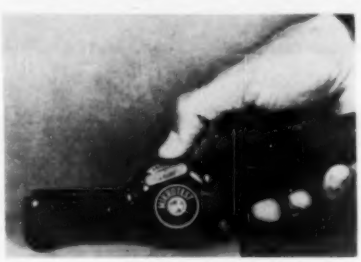
It combines its cleaning properties with the ultimate in surface conditioning to provide maximum adhesion of plated coatings on diecastings. In addition, the surfaces of polished diecastings are not darkened or discolored, and as a result, the overall appearance of the final plate is improved. In addition to these operating advantages, this newest development is low priced.

**E—1106. POLISHING CLOTH**—A new polishing cloth has been developed by the Pellon Corp. and Geoscience Instruments, Inc. Especially suited for metallographic specimen preparation and metal finishing, it is said to produce the high, flat polishes required for metallographic analysis and precision finishing.

**E—1107. THICKNESS GAGES**—The Mikrotest dry film thickness gages now are available in two ranges—one for lacquers, enamels, etc. has a range of 0 to 20 mils, while the other model is for measuring platings, galvanizing, etc. This has a range from 0 to 2 mils.

Both of these gages are said to measure a thickness of any non-magnetic coating on a magnetic (iron, steel, etc.) base. Maximum error is 10 per cent + 0.0004.

Both of these instruments are easy to use and both respond with a click that can



be both heard and felt when the correct measurement is made.

An important feature of these gages is the fact that human differences in touch do not affect the readings.

With this gage surfaces can be measured in any position. This is important when measurements are made on perpendicular walls, internal contours and other ordinary hard to measure surfaces.

Mikrotest gages are products of the Nordson Co.

**E—1108. ZINCATE IMMERSION COMPOUND**—The Diversey Corp. has announced a new zincate immersion compound for coating aluminum work with a tightly bonded film of metallic zinc before electroplating with other metals.

According to the Diversey announce-

ment, the new compound—designated ZN-77—provides for lower use concentrations, faster drainage of solution from processed parts, reduced drag-out losses and greater tolerance to temperature variations.

It is a rapidly soluble, free-flowing granular material. It does not cake under normal storage conditions.

**E—1109. BLAST CLEANING ABRASIVE**—A completely new blast cleaning abrasive designed to occupy a position between present malleable abrasives and steel both from the standpoint of performance and initial cost has been announced by Pangborn Corp. The manufacturer labels the new abrasive Pangborn G—"a significant development, the product of a longtime research program" and further describes it as "a material as close to steel as possible to make in a cupola." It is reported to last up to 2— times longer than malleable abrasives although not as long as premium grade steel shot.

**E—1110. TUMBLING MACHINE VARIABLE SPEED MOTOR**—A new variable speed motor on the Model C single oblique tilting tumbling machine is being offered as an optional feature by The Baird Machine Co. The new motor offers a quick and easy means of varying the barrel turning speed; this is highly advantageous for job shops and shops handling a variety of parts. It provides efficient tumbling as related to size and metal

composition of parts being finished and type of abrasive media used.

Baird's Model C tumbling machine is offered in two sizes. The No. 1, using a variable speed motor, has ½ horsepower and output speed of 1800–600 rpm, with a barrel speed range of 15–45 rpm. The No. 2 machine with a variable speed motor has 1 horsepower output, speed of 600–1800 rpm and barrel speed range of 17–51 rpm.

**E—1111. ANODIZING DYE**—Introduction of a new dye for coloring anodized aluminum, Aluminum Olive Green I, (patent applied for) has just been announced by Sandoz, Inc. The product is a homogeneous anodizing dye with resistance to sunlight and heat fading. Due to these advantages it is said to be especially suited for Olive Drab shades on military equipment.

It may be used as a self shade or in combination with other dyes to produce a complete range of colors from olive green to khaki.

**E—1112. BURNISHING COMPOUND**—A new product, designed for burnishing zinc, aluminum, steel and other metals, has been introduced by Oakite Products, Inc.

This new compound, Oakite FM 286, is said to work well on all metals except magnesium and offers many advantages not found in similar materials. Unlike most other burnishing compounds, it is mildly acidic, and produces brilliant blue-white color on zinc die-castings. It often eliminates the need for the bright dip operation on metals which develop oxide films. Since it contains no soap, it will not leave a film to hinder plating. It is claimed to have greater hard-water tolerance than comparable materials.


*For Metal Finishers!*

Pressure Moulded NEOPRENE "CAPLUGS"

7 STANDARD SIZES

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| TO PLUG HOLE SIZE | 1/8-3/16 | 3/16-1/4 | 1/4-5/16 | 5/16-1/2 | 1/2-5/8 | 9/16-11/16 | 5/8-3/4 |
| TO CAP STUD SIZE | 3/32-5/32 | 5/32-3/16 | 3/16-1/4 | 1/4-5/16 | 5/16-3/8 | 3/8-7/16 | 5/16-1/2 |

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DETROIT 38, MICHIGAN

DUGGAN Masking Devices

**TRUE BRITE**
**Practical Products**

**TRUE BRITE Nickel Brightener**
the original high performance barrel nickel brightener. Still the standard.

**BRASS MAINTENANCE Solutions**
the easy way to control of color and performance of brass plating.

**OXYPHEN pH Papers**
Over 30 ranges to suit all possible solutions and conditions.

**SODIUM and POTASSIUM Copper Cyanides**
Highest quality soluble salts from our own production for all solutions.

*Bulletins available on all products*

**TRUE BRITE CHEMICAL PRODUCTS CO.**
96 Falls Ave. Oakville, Conn.

# PERSONALS

**GEORGE N. STUART** has been appointed works manager of The Seymour Manufacturing Co.

Mr. Stuart comes to Seymour with many years of experience in industrial management. From 1933 to 1947 he was associated with the Chrysler Corp., Chevrolet Motor Division of General Motors, The Western Cartridge Co., and with X-Ray, Inc., Detroit, where he was vice president and general manager.

In 1947 he joined the Olin Mathieson Chemical Corp. and held several executive positions with the company in New Haven. In 1955 he became plant manager and production manager of the company's plant in East Alton, Ill., where he served until joining Seymour.

Mr. Stuart attended the Detroit Institute of Technology and is a graduate of the University of Michigan.

♦

**RUSSELL T. COBB** has been promoted to assistant sales manager of The Seymour Manufacturing Co., Seymour, Conn.

G. N. Stuart

R. T. Cobb

Mr. Cobb joined Seymour in 1958 as manager of marketing research. When the company went into the production of stainless steel in 1959, he became manager of sales of stainless steel, while continuing his work as marketing research manager. In his new position he will retain his marketing and advertising responsibilities.

Mr. Cobb previously was with the General Electric Co. in Bridgeport, Conn., and Louisville, in the field of marketing and distribution research, and later was associated with the American Car and Foundry Division of ACF Industries, as senior market analyst. He attended the University of Connecticut, majoring in civil engineering, and received a BS degree in marketing from the University of Bridgeport.

♦

**JOHN R. STROM,** chemist and process engineer for the Roto-Finish Co., Kalamazoo, Mich. has been appointed to the newly created post of technical director of the Ransohoff Co., Hamilton, Ohio. Both the Roto-Finish and Ransohoff Companies are under the same management.

For the past year Mr. Strom has had charge of the development of finishing compounds and metal cleaners for the two companies. Before joining Roto-Finish in 1958, he was a process engineer for Brown-Lipe-Chapin Div. of General Motors, and plating superintendent for the Eljer Company of Marysville, Ohio. He is a member of the American Electroplaters' Society.


FOR SALE

SEELEY

BUFFING COMPOUNDS

*For All Industrial Buffing*

Bar • Liquid • Greaseless

E. E. SEELEY COMPANY, inc.

P. O. Box 883 Bridgeport 1, Conn.

Chemical Polishing Cuts Aluminum Finishing Cost

America's Foremost Chemical Polishing Process. Alchemize levels surfaces, producing finishes from satin to mirror-bright on otherwise impossible shapes and sizes. Want proof? We'll process your samples and make recommendations without charge.

Alchemize concentrate is available in carboys, drums and tank trucks. Immediate service and delivery in U. S. and Canada.

alchemize corporation

Congress Expressway and South Kolmar, Chicago 24, Illinois

CHEMICAL POLISH FOR ALUMINUM

Alchemize

## PERSONALS

**DR. WILLIAM (BILL) BEACHAM,** internationally known consultant and paint chemist, has joined Ionic Electrostatic Corp. of Garfield, N. J.

Dr. Beacham is well known in the finishing field, for his technical magazine articles and his work with manufacturers in a consulting capacity, which include the Imperial Automotive Company of Bombay, Bus Manufacturers in Bangkok and automotive and aircraft manufacturers in London, Paris, Belgium, Iceland, South Africa and Australia.

He was for 16 years associated with Binks Manufacturing Co., as director of research laboratories, chief chemist and director of training.

Dr. Beacham received his Masters degree in chemistry at Ingraham University, London, England and his Doctorate at Sage Institute, Paris, France.

Dr. W. Beacham

R. Blackwell

**RONALD BLACKWELL** has been appointed to customer research assistance by Ionic Electrostatic Corp. Mr. Blackwell was formerly paint superintendent of Sunbeam Lighting Co. of Gary, Indiana. He is stationed at Ionic's Research Laboratory in Garfield, New Jersey.

♦

**JOHN J. HAGAN** has been appointed to the staff of The Hubbard-Hall Chemical Co., Waterbury, Conn. In his new position, Mr. Hagan will act as assistant to Frederick S. Foster, vice president in charge of the heavy chemical department of the Industrial Division.

Before joining Hubbard-Hall, Mr. Hagan was New England sales representative for the Anti-Freeze Division of Commercial Solvents.

♦

**HARRY C. IRVIN,** president of Allied Research Products, Inc., with plants in Baltimore and Detroit, was recently elected a member of the Maryland board of directors of the Southern States Industrial Council.

The Council is composed of executives from all types of business and industry in sixteen southern states, from Texas to Maryland.

Partial View of Tokyo audience addressed by Ezra Blount on August 6.

### JAPAN'S PLATING INDUSTRY VIEWED BY BLOUNT

#### PART II

Mr. Blount was impressed with the strides made by the Japanese plating industry since his last visit eight years ago. Highlights of the early part of his trip were reported in the September 1960 issue of PLATING MAGAZINE, page 1180.

The first of a series of technical meetings was held on August 6 at Seiyo-ken, a beautiful air-conditioned hall in Tokyo. Y. Ukai, consultant, acted as master of ceremonies; T. Tohei, president of the Tokyo Cooperative Assn., welcomed the 250 members.

The second technical meeting was held August 9 in Yamaguchi Hall under the auspices of the Metal Finishing Society of Japan, with Y. Ukai as master of ceremonies.

The Metal Finishing Society of Japan has about 1800 members, and Mr. Blount states it is, in many ways, the Japanese counterpart of the AES.

On August 10, Blount visited Nakamura Plating Company, a plant specializing in barrel plating of small parts with cadmium, zinc, copper, nickel and brass. Products there are finished for the radio, television and electrical appliance industries.

One large automatic zinc plating machine, 8 ft wide and 40 ft long holds eight 38- by 12-inch barrels at one time. Four semi-automatic machines apply zinc, cadmium, copper, and nickel. The conventional nitric acid bright dip is used following zinc plating, followed in turn by a chromate dip. Centrifugal machines dry the plated parts. The 35 employes can produce 10 tons of plated ware per 10-hour day.

Koka Chrome Industry Co., Ltd., another Tokyo plant visited, hard chromium plates brass camera parts, aluminum parts, stainless steel towers, parts for the chemical industry, and many kinds and sizes of steel shafts, journals, rolls, engine cylinders, and industrial parts. Porous chrome is applied to cylinders. Facilities in the five buildings that comprise this plant include 19 chromium plating tanks with a total capacity of 10,000 gal of solution. Established in 1940, the company has 135 employes and operates round-the-clock.

Koyo Kemmazai Company manufactures polishing and buffing compounds, abrasive belts and coated-abrasive-leaf polishing wheels. Facilities in several buildings (180,000 sq ft of floor space) include equipment for grinding, classifying, washing and filtering abrasive materials. Abrasive cloth is manufactured on a continuous machine. Founded in 1926, the company now has 240 employes.

Kokusan Kinzoku Industry Company is a manufacturer and plater of die castings. Like similar products in the United States, the plated die castings are supplied to automobile manufacturers for car door handles and hardware or trim, to refrigerator and air conditioner manufacturers, and to the builders' hardware industry. Founded 38 years ago, the company now has two plants, one of which is the largest complete die casting manufacturing and plating plant in Japan.

First visit in the Nagoya area was made at Sanshin Seisakusho Co., the only Japanese manufacturer of filters for the plating industry. Now 12 years old, the company manufactures about 200 filters per month; it has 130 employes and three plants.

Nagoya Plating Company is the largest job plating shop in Nagoya. Stainless steel parts are buffed, steel and die cast parts are copper, nickel, and chromium plated, steel parts are zinc plated and chromate dipped. Employes (160) work six full days per week. Their average age is 21 years; 40 per cent of them are women

Chuo Seisakusho Co. manufactures mechanical rectifiers (Vertoro), and selenium and silicon rectifiers. This company also designs and manufactures automatic and semi-automatic plating equipment of all kinds. It has a large engineering department as well as fabrication and painting facilities.

The Toyota Automobile Industry Co. is the largest auto manufacturer in Japan, producing 400 cars and trucks per day. The many buildings in this huge plant, its Technical Center, and new office building suggest to the visitor that he may be in the Detroit area of the United States.

Half of the large plating building is devoted to automatic and barrel zinc and cadmium plating of relatively small parts. The other half of the large building (400 feet long, 120 feet wide) is devoted to copper, nickel, and chromium plating of bumpers and die cast grilles for cars.

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This exclusive H-VW-M design uses only the *top-half* of the voltage range — the range you need for higher-voltage barrel processing. You get a high power factor unit with precise 22-step control, and can save as much as 5% on purchase price alone!

**3. The H-VW-M Anodizing Rectifier**

Automatic surge protection is a *built-in feature* of this specialized design: you can simply set it, and forget it!

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Unit offers accurate control to 1% of setting. Reliable and sturdy—built to rugged steel-mill requirements for low maintenance costs.

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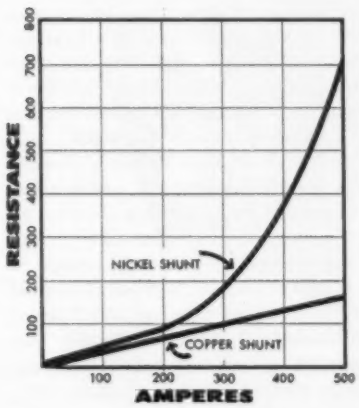
# NOW– GENERATOR BRUSH OVERLOAD ELIMINATED

A new H-VW-M Equaload Brush makes overloading impossible. Result: Commutators can now last the life of generators – without resurfacing.

A braided nickel shunt on the new Equaload Brush completely eliminates unequal current distribution because nickel's resistance to current flow increases proportionately with temperature rises. See curve below.




When any brush accepts more than its proportional share of current, the temperature of the shunt rises, its resistance increases and current is immediately distributed equally among the other brushes.

Use of a braided nickel shunt is *exclusive* with H-VW-M. The new H-VW-M Equaload Brush is designed to fit all makes of DC generators.

**H-VW-M Form "A" Tank Rheostats** – Designed to eliminate all switch failures caused by excessive heating. Standard sizes available with ratings from 30 to 1000 amps. Larger sizes to 5000 amps can be furnished.

**H-VW-M Universal Carbon Pile Tank Rheostats** – Provide continuous voltage control from fixed plating line voltage source in ranges to 250 amps, 6 to 12 volts.

**H-VW-M Motor Generator Sets** – Available up to 50,000 amps. Standard voltage ratings are from 6 to 250 volts.

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**MILTON NADEL** has been appointed general plant manager of Levco Metal Finishers, Long Island City, N. Y.

Mr. Nadel has been with Berkeley Industries for the past 14 years as supervisor of metal finishing of all their divisions. Educated at the University of Alabama and Polytechnic Institute of Brooklyn, Mr. Nadel has spent many years in furthering educational facilities for the plating fraternity. Past president of the New York Branch of the American Electroplaters' Society, he is at present its secretary-treasurer. Among his many other activities, Mr. Nadel is also the convention chairman for the 1965 AES National Convention.

D. P. Dorman

M. Nadel

**D. P. DORMAN** has been appointed Western sales manager for Cleveland Process Corp. The offices are located at 721 No. La Bren Avenue, Hollywood 38, California.

For the past three years, Mr. Dorman was a sales representative for Clepco's products in Southern California. He received his engineering education at the college of the City of Detroit and entered the business world serving the automotive industry in that city.

♦

**PETER J. KORNETT** has been elected to the board of directors of Oakite Products, Inc.

Mr. Kornett, a graduate of the College of the City of New York, joined Oakite in 1941 as a control chemist. He is now the company's general manager of manufacturing, and is responsible for the production of the firm's 165 products.

♦

**L. J. STOCKWELL**, St. Clair Shores, Mich., and **C. W. COCKRUM**, Hickman Hills, Mo. have been named sales representatives for the Metal Industries Division of The Diversey Corp. Mr. Stockwell will serve the Detroit area and Mr. Cockrum will make his headquarters in Kansas City.

## FRED D. ROGERS

Fred D. Rogers, 48, librarian of the AES Toledo Branch, died September 18. He was sales representative for Bruce Products Company. Formerly he was employed by the DeVilbiss Company.

## DR. CLYDE A. CROWLEY

Dr. Clyde A. Crowley, 58, died suddenly on Wednesday night, September 21, at Tempe, Arizona. A member of AES Phoenix Branch and chairman of the Arizona State University chemistry department, Dr. Crowley had been instrumental in forming the Phoenix Branch and was toastmaster at the installation ceremony on October 9, 1959.

Dr. Crowley died at a meeting of the alumni advisory board of Lambda Chi Alpha fraternity. He was talking on what the fraternity meant to him when he collapsed. Two doctors who rushed to the fraternity house on the ASU campus, said he apparently died of a heart attack.

A native of Ray County, Mo., he joined the faculty staff four years ago.

He had published more than 600 scientific articles.

Dr. Crowley taught in high school in Kansas City, Mo. After he quit teaching, he formed the Technical Service Bureau Inc., Chicago, which published hundreds of technical articles and served as a research consultant firm. He was a licensed engineer in Illinois, Missouri, and Pennsylvania.

Dr. Crowley Sold his interests in the firm and, during World War II, was a consulting chemical engineer for the U.S. Bureau of Mines. Dr. Crowley was radiological defense director in Arizona's civil defense program.

He is survived by his wife, Jeannette; a son, James H. of Phoenix; a daughter, Mrs. Robert A. Fagersteron of Libertyville, Ill., and a sister, Mrs. S. C. Inman of Muncie, Kan.

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| *4.8–6.2 pH | 7.3– 8.7 pH |
| *3.6–5.0 pH | 8.6–10.0 pH |
| *2.4–3.9 pH | 10.1–11.3 pH |
| 1.0–2.8 pH | 10.5–13.0 pH |
| 0.4–1.4 pH | 11.0–13.1 pH |

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# BRANCH NEWS

Total AES Branches U. S., Canada, Australia, November 1, 1960—59.

## BLUE RIDGE
### Saltonstall on Agitation in Electroplating

The regular monthly meeting was held September 9, in the State Room of the Hotel Robert E. Lee in Winston-Salem, N. C. Thirty-one members and guests attended. Branch President **Bruce E. Wallace** presided over the business meeting.

At the business meeting **T. R. Boggess** was presented with a past president pen. The second item of business was the election of delegates for the coming year. Those elected were: T. R. Boggess, **Donald McGee** and **Mike Milo.** The alternates are **Dr. Nelson Murphy** and **Howard Welfare.** Seven new members were elected.

After the business meeting, **Clem Hohner** introduced **Dr. R. B. Saltonstall** who presented a talk on "Agitation in Electroplating." His talk covered the history of agitation of electroplating solutions in both the United States and England. The various methods of agitation were discussed—cathode, solution, air and ultrasonic agitation. The talk also covered the many reasons for agitating plating solutions.

**Donald H. Mc Gee**
*Secretary*

## BRITISH COLUMBIA
### Committees Formed At Executive Session

The first executive meeting of this season was held on September 8 at 7 p.m., in the office of Coast Testing Laboratories, 4th Avenue, Vancouver.

A telephone committee was formed with **H. Schenke** and **J. Herford** in charge.

On the recommendation of the executive, business meetings will be held at the same time as the executive meetings, and an open invitation to attend extended to all members in good standing.

The general meetings in the future are to be reserved for technical subjects or social evenings.

An entertainment committee was formed consisting of **G. Amos** and **G. Caslor.** Additional members to be provided when required.

In the event of the executive being unable to obtain AES or other suitable speakers, it has been suggested that a shop operator or worker be prepared to discuss such topics as tank linings, shop problems, or similar ideas that may be mutually beneficial to all.

**C. Schlossareck**
*Secretary*

## BUFFALO
### Benning Discusses Duplex Nickel; Want 1967 Convention

The Buffalo Branch held its first meeting of the new season on September 9 at the Niagara Manor in Buffalo, N. Y. with 35 in attendance.

**John Donaldson** introduced the guests of the evening: **Donald Hutchison** of Harshaw Chemical Company and **Dr. William Sheridan** of Sylvania.

**Roger Brown,** our treasurer, stated he has AES Membership pins for sale and advised members to purchase them.

John Donaldson advised the Buffalo Branch is attempting to increase membership by at least 10 per cent in accordance with a request from National Headquarters. Mr. Donaldson has prepared a unique membership flow chart showing increase in percentage of membership. The committee assisting Mr. Donaldson consists of: **George Wolf, Eric Sampson, Robert Potter, William Bishop, Simon Bush, Stanley Bush, Donald Pembridge, George Bartle.**

**Chuck Fotheringham** was appointed chairman of the forthcoming annual Christmas Party and will be assisted by **Daniel Stackowiak** and **Mel Stachura.**

Mr. Fotheringham reported on the facts revolving around the 1966 Convention being awarded to Southeastern Branch, and to be held in Miami, Florida. This having been voted after Buffalo was the first to submit a formal bid.

Buffalo Branch members in attendance at the Los Angeles Convention were: **Mrs. Joan Wiarda, Robert Castle** and **Ralph Stemmerich.**

A motion was made, seconded and voted favorably that Buffalo formally bid for the 1967 Convention.

After the business session Librarian **John Tiebor** introduced the speaker of the evening, **A. C. Benning,** sales manager of electroplating process sales and field technical service for Harshaw Chemical Company. Mr. Benning presented an interesting and informative talk on Duplex Nickel particularly in its application to zinc die cast plating.

The third speaker of the year, scheduled for November 4, will be **C. M. Weege Jr.,** of Industrial Filter & Pump Mfg. Co. His subject is "Filtration of Electroplating Solutions."

**Robert C. Eich**
*Secretary*

## CHICAGO
### Panel Members Discuss Automation

The members of the Chicago Branch met for the first session of the 1960–61 season, on Friday, September 9 at Petricca's Restaurant, 510 North Western Avenue. This site was selected by the board of managers for future meetings during the year. **Matt Dassinger,** president, gave a brief report on the golf outing which was held at the Glendale Country Club. The outing was successful and everyone is looking forward to next year's event. **Si Gary,** librarian, discussed the speakers for the next two meetings. **August Mendizza,** Bell Labs, will speak on "Corrosion Problems" and **Art Bartman,** in November, will be the chairman of a panel on "Organic Coatings."

Si introduced **Don Morris** of Hanson-Van Winkle Munning Co. who acted as chairman of the panel which discussed the subject of "When to Automate." The panel members were **Larry George** of Udylite Corporation, **William Geissman** of National Lock Company and **Vincent Mattacotti** of Milwaukee Plating. Mr. George's views were that if a machine can do the work—get one! Mr. Geissman contended that labor and the parts are determining factors. Mr. Mattacotti's view was that the ability to handle a large work load with reduced labor should govern "when to automate." He also favored small tanks in the machine to take advantage of the high-speed plating baths that are prevalent today, which will reduce the cost of an automatic plating machine. There was a general agreement that on a simple plating line where the cycle has a few cleaning dips, a hoist line will suffice. An automatic is required where the cycle is complicated and has a number of tanks for cleaning and preparation of the metal before plating. All the members enjoyed the panel discussion and the panel was given a rising vote of thanks for the interesting discussion.

**Christopher Marzano**
*Publicity Chairman*

**BRANCH SECRETARIES**

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

# NEW LITTLE STEVE BARREL MACHINE

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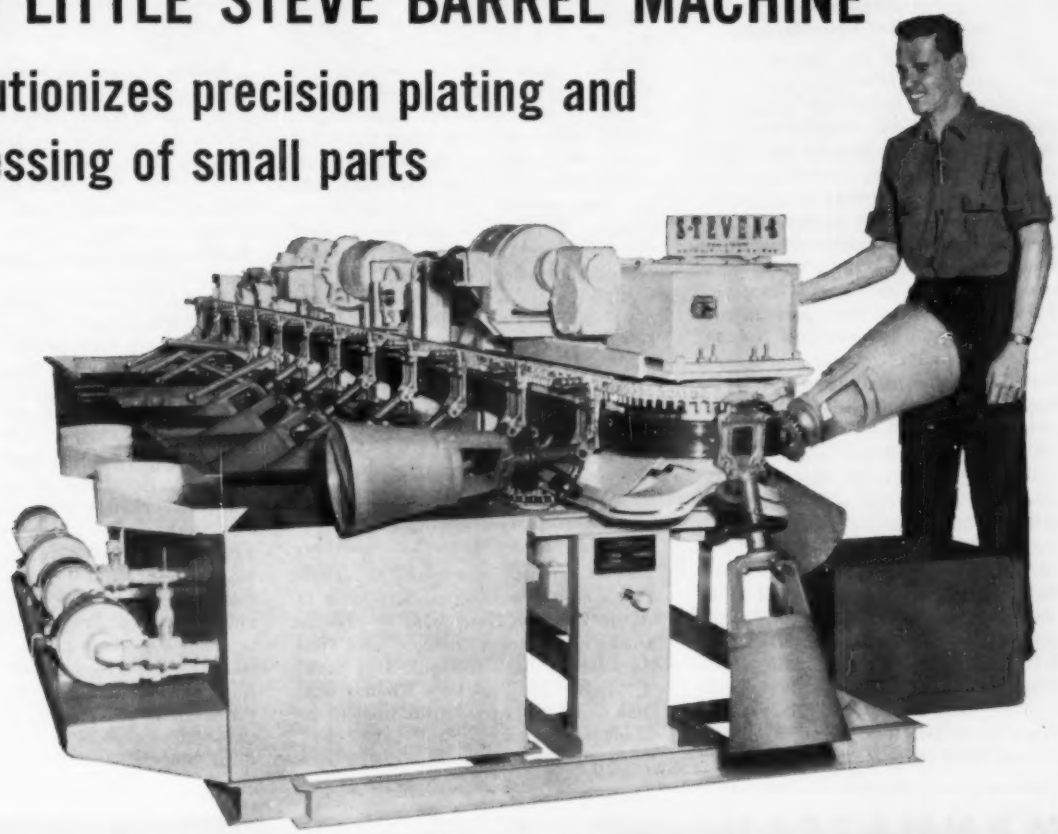


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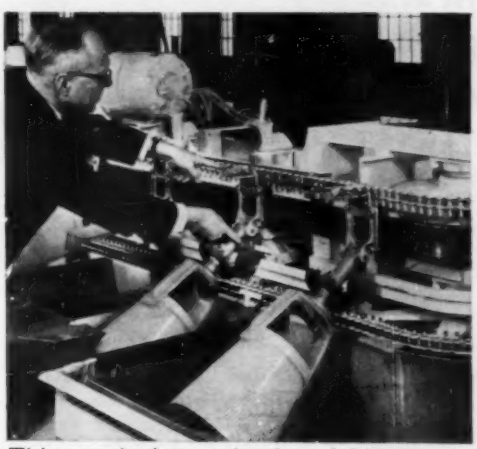
Meet the newest member of the famous Little Steve family of automatic plating and processing machines. It is small . . . only 4 feet high by 6 feet wide . . . not much higher or wider than your desk. Designed for use in your integrated operations, it incorporates features that meet today's rigid manufacturers' specifications. For example, this new Little Steve provides: • **precision plating on an automatic basis • low ceiling height and light floor load • designed for integrated process manufacturing • oblique barrels that require no lids • automatic loading and unloading • minimum solution and anode requirements.**

PLUS many more of the exclusive features that are part of every dependable, long-lasting, efficient Stevens plating and processing machine.



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## CINCINNATI

### Max Discusses Plating of Records

The activities for the 1960–61 year of the Cincinnati Branch began on Wednesday, September 28, at the Engineering Society with a dinner followed by a brief discussion by **Louis Morelli** on "Capital Punishment". During the business meeting, attended by 57 members and guests, three men were elected members. **President Leonhardt** appointed **Dick Evans** and **Clyde Seymour** as chairmen and vice chairman of the Picnic Committee. The following men were appointed to represent the Branch at the National Convention in 1961. Delegates: **Gerard Poll Jr., William Stephenson, David Kaplan.** Alternates: **Robert Winston, Ezra Blount, Curt Varland.**

The highlight of the evening was a discussion by **Dr. A. M. Max** of R.C.A. on the "Contribution of Electroplating to High Fidelity Records." The program began with a movie which depicted all of the steps required to produce a high fidelity record, from the original recording of the work to the shipping of the finished records. After the movie, Dr. Max discussed in detail the plating operations involved during the production of the records. The basic steps: The original recording (lacquer master) is sprayed with a silver coating to make it conductive and then it is plated with nickel, a copper strike, and heavy deposit of copper. The resultant "metal master" is separated from the lacquer master and plated with nickel. This nickel layer is separated from its master producing what is referred to as a "mold". After the mold is inspected it is plated with nickel, and again the nickel layer is separated and placed in the press which stamps out the finished record. The last electroformed layer is known as the stamper. Dr. Max discussed the details of the operating conditions and the strict controls which are maintained.

After a question and answer period, the group adjourned to the Social Hour sponsored by Bill Young and Co; **Bill Young,** Dick Evans and **Charles Whitt** as hosts.

**David L. Kaplan**
*Secretary*

## DAYTON

### Develop Membership Drive; Bellinger and Modjeska Speakers

The Dayton Branch opened the season with a regular meeting on September 21 at the Biltmore Hotel with 38 present. Among the visitors introduced were **Tom Hackett** of Delco Products, **Jim Lever** of Wright Field, and **Bob Wiedemann, Dick Evans** and **Stu Chipman,** all of the Cincinnati Branch.

The chairman of the membership committee, **Bob Fisher,** announced plans for a membership drive and asked everyone to assist by bringing interested visitors to the meetings.

**Walter Anderson,** librarian, outlined the program for the year which includes a fine variety of well known speakers. He mentioned particularly that **Dr. W. Andrew Wesley** will be honorary chairman of the 15th Annual Educational Session and Dinner Dance at the Hotel Biltmore on March 4, 1961. **Lawrence Hadlock** is the general chairman of this affair.

The featured speaker of the evening was **Kenneth Bellinger,** president of Conversion Chemical Corporation of Rockville, Conn. His subject "Trouble Shooting in the Plating Room" was based on more than twenty years experience in this field.

Mr. Bellinger pointed out that a good bit of trouble-shooting falls on the suppliers' representatives or on consultants. The perfect trouble-shooter must be familiar with the customer's operations through frequent calls and have the run of the plant so that he can recognize contributing conditions. The "T-S" must be ethical and honest, must not interfere with production, must test each step, work in the plant on problems or take them back to the laboratory if necessary. A complete statement of the problem often leads to the solution as does close observation of small things.


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Following the meeting refreshments were served through the courtesy of the F. B. Stevens Co. and their local representative, **Harry Brown.** The meeting adjourned and reconvened on October 20 when a dinner meeting was held at the Yum-Yum Restaurant with **Scott Modjeska** speaking on "Plating on Non-Metallics".

**L. A. Critchfield**
*Publicity Chairman*

### DENVER
### Bellinger Speaks On Conversion Coatings

The Denver Branch held its first fall meeting on September 8 at the Oxford Hotel. The officers met prior to dinner and discussed presenting a list of subjects to members for their preference of topics to be covered in future meetings. **Jim Jenkins,** vice president, presented a draft of bylaws to govern the Denver Branch. The regular business meeting followed a dinner which was attended by 20 members of the Branch. During the business meeting **Bob Martin,** president, gave the members a report of the National Convention. Delegates for the current fiscal year were elected.

The speaker for the evening **Kenneth Bellinger,** Conversion Chemical Corporation, was then introduced and gave a talk on "Chromated Conversion Coatings." Conversion coatings for zinc, cadmium, and aluminum were discussed. Included in the speech was dyeing of conversion coatings. Following the talk, colored slides were presented which stressed its advantages.

**Elmer Schuster**
*Secretary*

### DETROIT
### Two Meetings Feature Symposiums

The Detroit Branch held its first fall meeting of 1960 on Friday, September 9 at the Statler-Hilton Hotel in Detroit.

**John Siefen** was the technical chairman and the program for the meeting was a "Symposium on Basis Metal Preparation—Polishing and Buffing". The speakers were **Howard J. McAleer,** president of the Formax Manufacturing Corporation; **Lee Belanger,** divisional sales manager of Behr-Manning; and **Frank Romanoff,** technical director of the Apollo Metal Works of Chicago.

The session was attended by some 200 AES members.

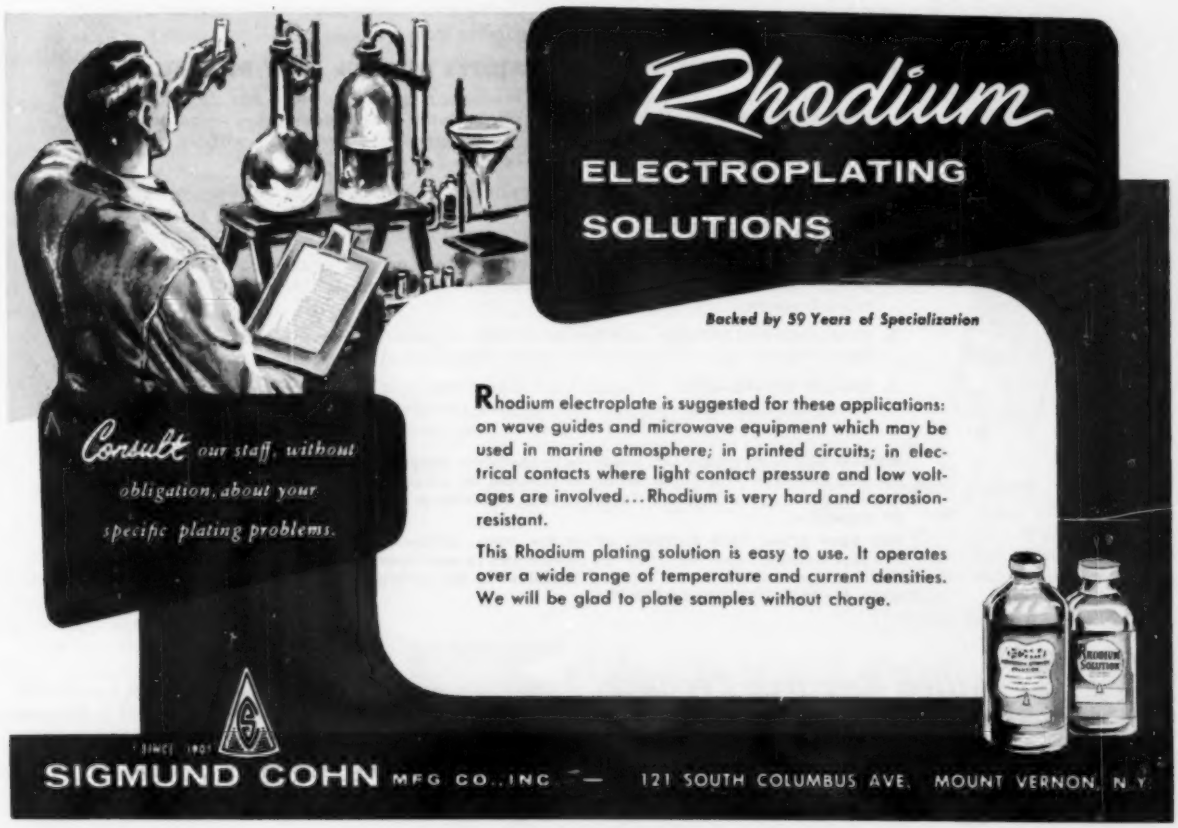
The October 7 meeting was also held at Statler-Hilton. **Bruno Leonelli** was technical chairman for a "Cleaning Symposium." The speakers included **Dr. A. Lloyd Taylor,** research director of the Ferndale Laboratory of MacDermid, Inc.; **B. J. Schotten,** director of research and development, Northwest Chemical Company; and **Edward J. Kubis,** manager of the metal finishing sales department of Wyandotte Chemicals Corporation.

### HARTFORD
### Mahlstedt Tells of Developments in Duplex Chromium

The regular Branch meeting was held at the Bond Hotel on September 19 and 43 members and guests were present. Preceding the meeting, a colored movie about research on heart disease was shown.

The guest speaker for the evening was **Henry Mahlstedt** of the Metal and Thermit Corporation whose subject was "Present Developments of Duplex Chromium".

Mr. Mahlstedt briefly reviewed the early history of chromium plating which was used to improve the corrosion resistance of nickel which tarnished readily. Nickel corrodes as it is anodic to chromium which is passive in air. Mechanism of cracking chromium plate explained how corrosion may proceed through these cracks and pits. Duplex chromium is plated on steel which has been copper and nickel plated. Two separate baths are used as one has better throwing power than the other. First a dull crack free chromium plate is deposited, then a brite cracked deposit. This cracked deposit reduces the potential in the openings which slows down the corrosion on the crack free deposit. The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4. **OVERLOAD PROTECTION**—our exclusive built-in protective devices shut down the rectifier before highly unusual overload or other dangerous situation causes damage to the cells.
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CASS and Corrodkote corrosion tests were explained and rating of corrosion by the ASTM method. Slides on corrosion tests of various coatings were also shown.

The technical chairman for the evening was **Arnold Johnson.**

**Stanley Platoz**
*Secretary*

### LANCASTER

#### Lancy Discusses Developments in Waste Treatment

The first meeting of the Lancaster Branch's fall season was held at Barbecue Cottage, Harrisburg East, on September 7. There were 30 members and 7 guests: **Robert Rice, Bill Kempf, Joe Burkhardt, John Horner, Ken Reigle, Williard Smith** and the speaker, **Dr. Lancy.**

**President Sharretts** appointed **George Geesey** chairman of the ladies night committee and asked **Jack Schreck** and **Meade Wilt** to help him. Ladies Night was held at the Hotel Hershey on October 8.

It was moved and approved that retired members be kept on the mailing list for meeting notices.

President Sharretts appointed **Joe Shockcor, Robert Plaisted** and Jack Schreck as delegates to the Supreme Society. **Chester Smith,** Paul Sharretts and **Charles Snyder** were appointed as alternates.

Under new business for the next meeting, President Sharretts suggested that we discuss ways and means of getting new members.

Our speaker was Dr. L. E. Lancy, of Lancy Laboratories, who discussed "New Developments in Waste Treating." Dr. Lancy pointed out the advantages of waste treatment methods which are integrated into the plating shop procedures, and showed slides explaining such installations particularly for cyanide and chromium. He showed that for many plating installations it was possible to completely eliminate waste disposal as a problem and that such treatment often reduces reworking and spotting-out, as well as avoiding legal difficulties.

**Martin S. Frant**
*Secretary*

### LOS ANGELES

#### Blount Reports on Visit to Far East Plants

The regular meeting on September 14 was opened by president **Frank Virgil.** Guests were introduced by sergeant-at-arms **Oscar Grizat.**

First Vice President **Emmett Babcock** read the names of seven applicants for membership and then introduced one man for acceptance into the Society.

**Bill Lidtke** reported that copies of the Plating Handbook are now available and discount prices will be offered for quantity purchases.


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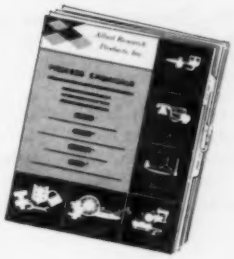

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**Norm McEwan,** who attended the Western Regional discussion at the July 28 meeting during the Convention, reported the formation of a Council of Far Western Branches of which the Los Angeles Branch would be a member. Speakers will be utilized by the member Branches at predetermined dates. Librarians from each Branch will be members of the Council. The attending membership then approved that the Los Angeles Branch become a member of the Council of Far Western Branches.

**Bob Pooler** reported that a note of appreciation had been received from the widow of **Charles Wentworth** for flowers sent by our Branch.

**Bill Thomas** was appointed 1961 educational and dinner dance chairman by President F. Virgil of Products Finishing.

**Ezra Blount** highlighted the meeting with an excellent report of his recent tour of Japan and Hong Kong. Aided by slides, Mr. Blount showed plating plants from the most modern to the most ancient. His presentation was followed by questions from the group on many points of his tour.

**Burton G. Adams**
*Publicity Chairman*

### LOUISVILLE

**Zinc Plating Presented by Kennedy**

The September meeting of the Louisville Branch met September 15 at Hasenours' Restaurant for a dinner meeting. The only business transacted was the appointing of Delegates and Alternates to the 1961 Convention. The Delegates are **S. J. Beyer, A. D. Russell** and **A. A. Oertel.** The alternates are **K. C. Reifsteck, A. E. Schweri** and **H. D. Bowsher.** It was also announced that the next meeting will be held in Lexington, Kentucky. We hope this will be the first of many meetings held in this new center of electroplating activity.

The speaker for the night, **Herb Kennedy** of E. I. DuPont DeNemours Co., was then introduced. His talk and slide presentation was entitled "Zinc Plating". His talk started on the history of zinc plating and its origin in replacing hot dip galvanizing. The advantages were appearance, low cost and controlled thickness. He discussed bath makeup, principles of operation, maintenance and control, effect of the cyanide to zinc ratio, effect of temperature, effect of Na OH and the effect of brighteners. Contaminants were listed with their effects and methods of removal. Conversion coatings were also discussed including the newer dyeing operations. A discussion period followed.

**K. C. Reifsteck**
*Corresponding Secretary*

### MIAMI

**Plating, the Metallurgist's Tool to Industry Presented**

The regular monthly meeting of Miami Branch was held on Sept. 16.

The speaker, **Francis S. Komassa,** chief metallurgist, Exhaust Parts Engineering, Inc. Hialeah, Florida, was introduced by **Duke Dent.** Mr. Komassa's work prior to coming to Florida was with such people as North American Aviation, Columbus, Ohio, G.E., G.M., Studebaker Packard, in the field of advance research and development of nuclear jet engine developments and guided missiles.

His talk, "Plating, the Metallurgist's Tool to Industry" was in a general vein rather than technical and was intended to prepare the plater to appreciate the need of achieving the recent and more difficult specifications required in missile and other fields of application; especially chromium deposition with its attendant embrittlement. The chemical or electrochemical milling for the removal of light metals such as aluminum and magnesium was touched upon.

The methods for success in deposition, including grain structure, hardness, embrittlement relief and nener microsonic and other measuring techniques were discussed.

Chemical and electrochemical milling were differentiated with most emphasis on the electrochemical milling methods using masks for the removal of predetermined thicknesses of metal from irregularly contoured surfaces.

The talk was well received and engendered a lengthy question and answer period.

**Fred Fulforth**
*Reporter*
**Abe Schorr**
*Secretary*

### MILWAUKEE

**Branch to Exhibit at Museum; Liffick on Soil Removal**

The Milwaukee Branch started the 1960–61 season with a dinner meeting in its new meeting room in the Maryland Hotel at 625 N. 4 Street on September 9.

The annual business meeting was held at 8:00 p.m. The budget for the year was


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approved and money appropriated to carry on the activities of the Branch. Those activities were explained and discussed by the chairmen of the several standing and special committees.

**Arthur Linn** reported that the membership committee would attempt to bring in 20 new members. He stated that campaign work was thoroughly organized and under way.

**Frank Marshall,** speaking for Program Chairman **Curtis Hunsaker,** explained the meeting format to be used this season and announced some of the subjects to be discussed. The Racine meeting will take the form of a party for the ladies and will be held Saturday, October 8 at the Racine Elks Club. On Friday, November 4 the organic and inorganic sections will meet for dinner and in joint session hear **Ezra Blount** speak on "Metal Finishing in Japan".

**Kenneth Olsen** explained the plans of the research committee to obtain new sustaining members and the reinstatement of others.

**Clinton Host** announced the appointment of **S. Choren, E. Johnson, G. Friedl** and **J. Stowasser** to the promotion committee. He regrted that the committee was working on an arrangement with the Milwaukee Public Museum to display an exhibit on metal finishing.

President **E. E. Piellusch** announced the appointment of **Henry Bornitzke** as chairman of a committee to study ways and means of printing a new directory of Branch members.

**Herman Tessman** reported on the Los Angeles Convention and discussed the progress made in arrangements for the 1962 Milwaukee Convention. He stated that most of the committee chairmen had been appointed and he requested that they begin to fill out their committees.

**R. Steuernagel,** H. Tessman and **Leslie Diveley** were inducted as Delegates. President Piellusch appointed F. Marshall, H. Bornitzke, and **S. Taterzynski** as Alternate Delegates.

Applications for membership made by **Harry Stollberg** and **Harvey Birnschein** were read and unanimously approved. They were welcomed as members of the Branch.

After the business meeting, Frank Marshall conducted the "question box" discussion, following which he introduced **Fenton Liffick** of MacDermid, Inc. who spoke on the subject, "The Nature and Removal of Soils Prior to Finishing".

The speaker classified the nature of soils in considerable detail and discussed the basic method of removal for each classification. He also discussed surfactants and the purposes and mechanisms involved with each of the several components commonly used in metal cleaners.

**Leslie L. Diveley**
*Secretary*

## MOHAWK VALLEY

### Precious Metal Plating Presented by Korbelak

President **Robert A. Stewart** opened the September 15 meeting at Twin Ponds Country Club, New York Mills, N. Y. by introducing the officers of our Branch to the 32 members and guests.

**Rene Sonnenfeldt** gave a report of the Los Angeles Annual Convention. He stated that it was a most interesting affair, with some very interesting papers presented.

The secretary reported one application for membership. The applicant was duly elected.

He also reported that R. A. Stewart and **Merle Ihrie** were appointed by the executive committee to represent our Branch at the Pre-Regional meeting this fall. The alternate delegate appointed was **C. A. Bridgett.**

The speaker for the evening was introduced by Librarian **Robert Krawczyk.** The speaker, **Al Korbelak** of Sel-Rex Corp., gave an interesting presentation about precious metal plating.

He stated that this jet age has developed many products which require precise and exacting characteristics and in large volume. In the past ten years several baths have been developed to meet these demands. It was stated that an improvement in specifications was a most desired need at present.

**Henry J. Crouse**
*Secretary-Treasurer*

## PHILADELPHIA

### Swift Explains Metallurgy For the Plater

The first meeting of the 1960/61 season was held at the Engineers' Club with 22


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at dinner and about 75 attending the meeting, including Dr. Heiman's electroplating class from Temple University. Following the call to order at 8:40 by Branch President **Cogan, John Swift,** Swift Industrial Chemical Co., spoke on "What the Plater Should Know About the Metallurgy and Manufacture of Steel and How These Factors May Affect Plating." Mr. Swift covered the major steel manufacturing methods and the effects on the finished steel as processed by the plater. He showed a considerable number of slides showing various steel testing devices, micro and macro photographs of defects and structural changes with various heat treating methods.

Due to the lateness of the hour following Mr. Swift's talk, transaction of Branch business was curtailed. Treasurer **Ross** gave his report; a committee to consider a candidate for AES Honorary Membership from the Branch will be appointed; a candidate for AES Scientific Achievement Award was approved; a motion was passed establishing a Branch permanent membership committee along lines recommended by the AES membership committee, incorporating a three-year membership to the committee on a rotating basis. The meeting adjourned at 10:35.

**I. Wm. Marcovitch**
*Secretary*

## PHOENIX

### Blount Speaks on Trip to Japan

Our first fall meeting was held at the Interlude Club, Thursday, September 15. This meeting was held on Thursday instead of our usual Tuesday night to enable our speaker, **Ezra Blount,** editor of *Products Finishing*, to meet with us.

**Floyd Huhn,** president, opened the business meeting at 8:00 p.m. welcoming three guests, **Walt Walzak,** Sel-Rex Corporation, **Willard Bell,** Chemical Research Company and **Al Wellman,** Goodyear Aircraft.

**Dr. Clyde Crowley,** head of nominations committee submitted the following slate for our 1960-61 officers: President, Floyd Huhn; first vice president, **James Weaver;** second vice president, **John Mullarkey;** secretary, **Paul Wible;** librarian, **Robert Hays;** treasurer, **Neva Johnson;** board of managers, Clyde Crowley, **Paul Madden** and **William Bath**

Approval was made by the membership.

James Weaver then appointed **Joseph Motil** to serve as sergeant-at-arms for the year.

Ezra Blount described his visits to the Japanese plating industry and showed a color movie of hard chromium plating.

Two applications for membership were submitted.

**Paul M. Wible**
*Secretary*

## PROVIDENCE-ATTLEBORO

### Nuclear Talk Enthusiastically Received

The September meeting of the Providence-Attleboro Branch was held in the Providence Engineering Society Building, 195 Angell Street, Providence, R. I.

The meeting was called to order by President **Dan Turner** and in the short business meeting Delegates and Alternates to the Supreme Society were elected. Delegates are **Pete Lonsbury, Ed Parker** and **Dan Turner,** with the alternates being **Sibley Kershaw, Henry Shavier** and **John Broadbent Jr.**

The speaker of the evening was **Ed Finerty,** project administrator, Metals and Controls Nuclear Division of Texas Instruments. His subject was "Nuclear Fuel Fabrication." The precision and care in which this material must be handled, even in storage, was told. Mr. Finerty took us through the fabrication step by step to point of where the fuel is installed in the reactor. He assured the members that no matter what happened in his plant, at no time will we ever see the familiar mushroom cloud over Attleboro.

At the end of his talk, questions flew thick and fast but the speaker answered all with an ease, which showed his great knowledge of the subject. An unusual number of those present went to Mr. Finerty to tell how much they had enjoyed the lecture.

**C. I. Healy**
*Secretary*


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## ROCHESTER

### Beuckman Honored For Attaining National Office

The Rochester Branch opened its 1960–1961 season on September 12 with a Victory Smorgasbord in honor of our own **Frank Beuckman's** election as third vice president of the National Society, at the Rochester German Club.

After the members present had eaten their fill, the powerful gavel of prexy **John Cipolla** brought the business meeting to order.

Prexy Cipolla related his experience at the National Convention highlighting our Branch's award presented to him for tieing San Francisco for first place in our Division of the 1959–1960 AES Branch Membership Expansion Competition.

Frank Beuckman was called upon, and true to form, he gave a very interesting and enlightening talk on the results of the National Convention and encouraged the members present to promote our Branch to non-members in related fields. He concluded by expressing his deep gratitude to members that were instrumental in his election as national third vice president.

After the applause finally died, prexy Cipolla presented the new officers of our Branch: John Cipolla, president; **Charles Fedeor,** first vice president; **William Elston,** second vice president; **Loring Carson,** librarian; **E. A. Pottridge,** treasurer and acting secretary.

Prexy Cipolla called to all members for assistance in making the Seventh Annual Empire State Regional Meeting, which is to be held here on May 5 and 6, 1961, a success by devoting some of their free time. The response was most assuring.

The meeting was concluded after Mr. Beuckman was presented with a scroll signed by the membership wishing him success in his new venture.

**E. A. Pottridge**
*Acting Secretary*

## SAN FRANCISCO

### Blount Discusses Far Eastern Trip

The monthly meeting of the American Electroplaters' Society was brought to order on September 8 at 8:45 p.m. by **Guy Condrott.** There were 45 members present. The following guests were introduced: **Jan Hanfield,** Wyandotte Chemical Co.; **Chaplin Hever,** U. S. Army; **Gary Winnick,** L. H. Butcher Co.; **Jack Sullivan, Peter Rollason,** Printronics; **Paul Ignacz,** Fairchild Semi-Conductor.

Librarian **Dick Mitchem** introduced our speaker, **Ezra Blount,** editor of *Products Finishing* magazine, who spoke on "Metal Finishing in the Far East."

Following the speech, there was an enthusiastic question and answer session.

The following points were discussed during our regular business meeting: **Stan Bammann** reported on final details of our annual picnic to be held Sunday, Sept. 25 at Laurel Park. **Harold Smallman** reported on the financial progress of the Suppliers' Contribution Fund.

**C. E. Snelgrove**
*Secretary-Treasurer*

## SOUTHEASTERN

### Weisberg on Precious Metals

The Southeastern Branch kicked off its new season again in competition with football games for attendance. The meeting was held September 9 at the Architects and Engineers Institute in Atlanta. Low attendance was partly attributed to sickness and death in several members' homes. Louis Rosenberg's wife passed away earlier in the week. H. R. Stogner's mother was critically ill in a local hospital. Our president, **Myron M. Randman,** was in St. Joseph Hospital recovering from a recent serious illness.

**Bob M. Taylor** presided over the small informal group which had gathered for the first meeting of the new season. After dinner and a short business session **Dave Griffin** presented the speaker. A very interesting informal discussion was held with **Alfred M. Weisberg** of Technic, Inc; the topic was "Precious Metals Plating".

Under the program direction of **George W. Taylor,** the Branch expects to have an increase from meeting to meeting. George has been fitting together a very interesting program for the year.

**Robert H. Probert**
*Assistant Secretary*

## SOUTHERN TIER

### Pettit Speaks on Etching of Metals

On Tuesday, September 20, Southern Tier held its first meeting, at the Deep Well Restaurant, Owego, N.Y., with the new officers presiding. A social hour was pleasantly enjoyed by the members and guests, sponsored by The Diversey Corp. Thirty-three members and guests attended the affair. Our new president, **Bill Rossiter,** called the meeting to order and welcomed the members and guests. Visitors were **Bob Englebee, Hyman Clifford, Donald Kattel, Stephen Zugo, Al Honeychuck** and **Leonard Carr.**

Librarian **Ralph Potter** presented the speaker **Dr. Ralph E. Pettit** of The Diversey Corp., technical advisor to the metal industries department. Dr. Pettit discussed informatively chemical milling of metals. He explained the art of etching of aluminum metal using chemical resistant material for masking, to produce name plates. By rotating parts in solution, a rate of 0.8 to 1 mil can be milled plus elimination of gasses. Nearly 100 slides were shown along with a large actual display.

A short business session concluded a pleasant evening.

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## SPRINGFIELD

### Barber, Bellinger and Gehman Comprise Panel

The Springfield Branch opened the 1960–1961 Season at Blake's Restaurant, on Monday evening, September 26. There were 24 members and guests present.

There was quite a lengthy business session, as the Branch bylaws are in the process of being brought up to date. Chairman is **Henry L. Heissfeld,** and on the committee with him are **Edward F. Koetsch Jr., Charles F. Griffin Jr.** and **Robert J. Girard.**

The following were elected Delegates to the National Convention in Boston, next year: Robert J. Girard, Henry L. Heissfeld, and **Edward R. Dupuis.** The Alternates are: **John E. Costigan, Alexander R. Salmond,** and Edward F. Koetsch Jr.

Two new members were elected.

After the business portion of the meeting, Librarian **Leo A. Diamond** presided over the Technical Session. The first speaker introduced was **Donald R. Barber,** vice president and general manager of Heatbath Corp., Indian Orchard, Mass. Don, also is second vice president of the Springfield Branch. As number one of the panel, Don Barber covered "Applications of Black Oxide Finishes".

The middleman of the panel was **Kenneth P. Bellinger** who owns and operates Conversion Chemical Corporation of Rockville, Conn., as well as being an active member of Hartford Branch. His topic was "Modern Trends in Chromate Conversion Coatings".

The third speaker of the group was **Hugh Gehman,** manager of the development department of Amchem Products Inc. of Ambler, Pa. The title of his talk was "Phosphate Coatings on Steel."

When the three phases of metal finishing had been thoroughly explained, the panel was receptive to questions.

**Henry L. Heissfeld**
*Secretary*

## TORONTO

### Beckwith Presents Nickel Plating: Symposium Planned

A most educational and informative talk was presented by the speaker of the evening, **Dr. M. M. Beckwith,** of Harshaw Chemical, at our regular dinner meeting held September 9 in the Algonquin Room of the Royal York Hotel.

Dr. Beckwith traced the development of nickel plating from the Watts bath, to bright nickel and the more recent duplex coatings. The progress plating researches have made toward increasing corrosion resistance with nickel coatings was reported and explained in a most enlightening manner by Dr. Beckwith, who expertly handled a barrage of questions from the floor

During the business session a motion presented by our past president, **Ray Day,** suggesting that a technical symposium be held in Toronto in the spring of 1961, was carried. More details of this symposium will be reported as they develop.

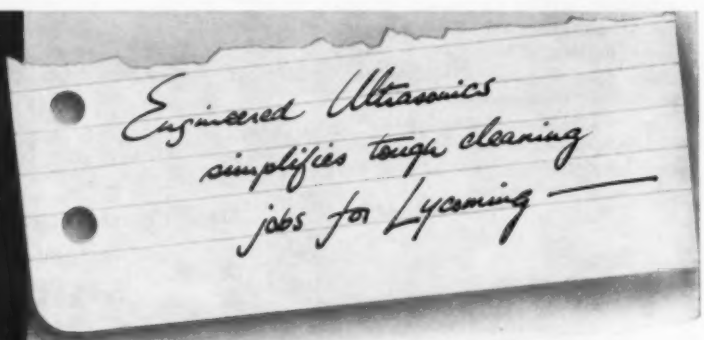
**Brock Laws,** entertainment chairman, moved that the annual regional convention, held for many years at Niagara Falls, be abandoned and that an elaborate ladies night be held in Toronto, on a separate date from, but in conjunction with, the proposed technical symposium.

It was pointed out that these two activities would parallel and replace the Niagara Falls convention while the Toronto location should make them available to a much larger percentage of membership by reducing traveling and weekend hotel costs. The motion, seconded by **A. T. Patterson,** was carried.

Mr. Laws also announced that the annual fall dance of the branch would be held this year, at a new location, at Canada's famous "Casa Loma", November 11. In past years, attendance has proven this affair to be the most popular social activity of the Toronto Branch and it is expected this year will be no exception.

**Don Walker** proposed the acceptance of two new members. The motion, seconded by **Mr. Darbyshire,** was carried.

Mr. Darbyshire, our treasurer, reported a small profit was made on the overall activities of the Branch last year.

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The meeting was presided over by our president, **Gord Lince.**

**Brock W. Laws**
*Librarian*

### WATERBURY
### Talk Given on Highway Safety

The Waterbury Branch opened its 1960–61 season with its September meeting at the Roger Smith Elton Hotel. President **William Giesker** called the meeting to order at 8:00 p.m. He announced that the following appointments had been made at the recent business meeting! **Francis A. Schneiders,** publicity and **Clarence Foster,** assistant librarian. President Giesker appointed **Raymond Mitchell,** Research Chairman. Certificates of membership were awarded by Secretary **James Kennedy** to two new members.

Technical Chairman **Donald Mencio** introduced the speaker of the evening, State Trooper George Zonas of the Connecticut State Police. His subject was "The Present State Police Enforcement Program and Highway Safety". It was an excellent and thought provoking presentation of the problems and the efforts to overcome the problems of traffiic safety.

The meeting was followed by refreshments.

**F. A. Schneiders**
*Publicity*

## BRANCH EDUCATION

### AT SAN FRANCISCO

**Bill Ferry** reports that his Electroplating Course commenced Tuesday, September 20 and is given each Tuesday night at 7:00 to 9:00 p.m., at Cubberly High School, 4000 Middlefield Road, Palo Alto, Calif. Entrance fee, $3.00. The course of study is of the apprentice training type on high school level.

### AT SPRINGFIELD

The AES Springfield Branch, in conjunction with the Massachusetts Department of Vocational Education and the Chicopee Vocational High School, sponsors evening classes in the "Fundamentals of Electroplating" and "Electroplating for Engineers."

The "Fundamentals of Electroplating" course is held each Tuesday night for 12 weeks from 7 to 9 starting Oct. 11.

The course "Electroplating for Engineers" is held Thursday nights for 12 weeks from 7 to 9 starting Oct. 13.

Twelve students were the minimum number required in each course. Eighteen and 14 students enrolled for the courses in the order mentioned.

The courses are conducted by **Robert J. Girard** of Chicopee Falls, foreman of the metal finishing shops of the armory operations division at the Springfield Armory, and **Edward F. Koetsch Jr.,** plant chemist at the Springfield Armory.

The course in Fundamentals will include: Introduction to Electroplating, Metal Cleaning, Solvent Degreasing, Precious Metal Plating, Oxide Coatings, Hazards in a Plating Shop. Subjects covered by Electroplating for Engineers are: Introduction to Electroplating Engineering, Metal Surface Preparation and Cleaning, Solvent Degreasing (thorough coverage in eight sessions) and Plating Shop Hazards.

### AT TORONTO

An announcement has been made that the Toronto Board of Education will again be conducting a night school course in electroplating. The teacher this year will be **Roe Clark,** member of the executive of the Toronto Branch. Classes will be held at Central Technical School. Mr. Clark replaces **Ross Moore,** who for the past number of years, has done a most creditable job in this capacity.

**PLATING MAGAZINE invites AES Branches to furnish news for publication in PLATING concerning electroplating courses sponsored.**

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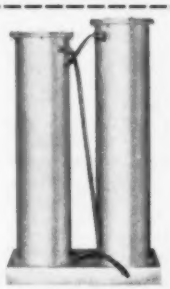

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**PLATING CHEMIST**—38, B.Sc. (London) with successful record of 8 years varied, progressive experience in all phases of process and production control, desires position in research, production or plant control with opportunity for experience and advancement. Would prefer New York, New Jersey and New England location. Reply Box N3, PLATING, 445 Broad St., Newark 2, N. J.

**PLATING ENGINEER—SUPERVISOR—TECHNICAL SALES**—Graduate Chemist, age 42, with diversified plating experience as sales engineer, chemist, and plant superintendent. Experience includes planning, development, trouble shooting, physical testing, field service, metal and plating solution analysis, quality and production control scheduling. Presently employed as superintendent. Seek position in the Chicago area but will consider other locations. Reply Box N4, PLATING, 445 Broad St., Newark 2, N. J.

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**PLATING SUPERVISOR**—Desires position where broad experience in production, maintenance and analyzing of all types of solutions can be fully utilized. Has had 35 years of Supervisory experience, more than half of that time supervising 60 people in job plating plant. Has worked for lamp manufacturer producing antique and all kinds of oxidized finishes. Immediately available. Reply Box N6, PLATING, 445 Broad St., Newark 2, N. J.

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**EASTERN PENNSYLVANIA TECHNICAL SALES REPRESENTATIVE**—Leading Eastern Manufacturer of Cleaning, Burnishing, Deburring, Aluminum Treating and Related Compounds, with distributorship of complete line of plating equipment and supplies offers excellent opportunity to ambitious young man. Thorough knowledge of metal finishing operations required; selling experience not essential. Liberal commissions and benefits. Send complete resume to Box N10, PLATING, 445 Broad St., Newark 2, N. J.

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## FUTURE MEETINGS

### AMERICAN ELECTROPLATERS' SOCIETY

**December 2-3, 1960**—**Detroit Branch Annual Educational Meeting and Banquet,** Statler-Hilton Hotel, Detroit, Mich.

**December 3, 1960**—**Executive Board,** Hotel Statler, Detroit, Mich.

**December 16, 1960**—**Editorial Board,** National Headquarters, Newark, N. J.

**December 16-17, 1960**—**Newark Branch Annual Educational Session and Christmas Banquet,** Robert Treat Hotel, Newark, N. J.

**January 21, 1961**—**Grand Rapids Branch,** Annual Educational Session and Banquet, Symposium on Quality Control, Pantlind Hotel, Grand Rapids, Michigan.

**January 27, 1961**—**Research Committee,** Conrad Hilton Hotel, Chicago, Ill.

**January 27, 1961**—**Cleveland Branch, Annual Educational Session,** Technical Center, Cleveland Engineering Society, Cleveland, Ohio.

**January 28, 1961**—**Cleveland Branch, Annual Banquet and Dinner Dance,** Carter Hotel, Cleveland, Ohio.

**January 28, 1961**—**Chicago Branch Annual Meeting and Banquet,** Conrad Hilton Hotel, Chicago, Ill.

**February 3-4, 1961**—**Third Annual Dixie Regional Technical Session,** Hotel Roanoke, Roanoke, Virginia. Blue Ridge Host Branch.

**February 4, 1961**—**New York Branch Annual Educational Session and Banquet,** Hotel Statler-Hilton, New York, N. Y.

**February 4, 1961**—**Saginaw Valley Branch Annual Educational Session and Banquet,** Frankenmuth, Michigan.

**February 4, 1961**—**Seventh Annual Tri-State Regional Meeting,** Deshler-Hilton Hotel, Columbus, Ohio.

**February 11, 1961**—**Eighth Interim Meeting,** Supreme Society, Statler Hotel, Hartford, Connecticut. New England Regional Council, Host.

**February 18, 1961**—**San Francisco Educational Sessions and Dinner-Dance,** Jack Tar Hotel, San Francisco, Calif.

**March 4, 1961** (Tentative Date)—**Philadelphia Branch Annual Technical Session and Banquet,** Benjamin Franklin Hotel, Philadelphia, Pa.

**March 4, 1961**—**Dayton Branch 15th Annual Educational Session and Dinner Dance,** Biltmore Hotel, Dayton, Ohio.

**March 11, 1961**—**Rockford Branch, Annual Meeting,** Rockford, Ill.

# FUTURE MEETINGS

| | |
|---|---|
| April 8, | 1961—**Editorial Board Meeting,** Statler-Hilton Hotel, Detroit, Michigan. |
| April 14-15, | 1961—**Executive Board Meeting,** National Headquarters, Newark, N. J. |
| April 15, | 1961—**Baltimore-Washington Branch,** Annual Banquet and Dance. Presentation of the "Order of the Pot," Baltimore, Maryland. |
| April 22, | 1961—**Twenty-Second Annual New England Regional Meeting,** Hotel Statler, Hartford, Conn. |
| April 24-25, | 1961—**AES Research Conference,** Bell Telephone Laboratories, Murray Hill, N. J. |
| April 26, | 1961—**Research Committee Meeting,** National Headquarters, Newark N. J. |
| April 29, | 1961—**Milwaukee Branch Annual Educational Session and Banquet,** Schroeder Hotel, Milwaukee, Wis. |
| May 2, | 1961—**Central Michigan Branch Annual Educational Session and Banquet,** Hotel Hayes, Jackson, Michigan. |
| May 5-6, | 1961—**Empire State Regional Meeting,** Hotel Manger, Rochester, N. Y. |
| June 18-23, | 1961—**48th AES Annual Convention,** Hotel Statler, Boston, Mass. |
| January 13, | 1962—**Ninth Interim Meeting, Supreme Society,** Hotel Marott, Indianapolis, Ind. |
| June 25-28, | 1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council. |
| June 24-27, | 1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch. |
| June 15-18, | 1964—**51st AES Annual Convention,** St. Louis, Missouri. |
| June 16-18, | 1964—**Sixth Industrial Finishing Exposition,** St. Louis, Missouri. |
| June 28-July 1, | 1965—**52nd AES Annual Convention,** Statler Hotel, New York, N. Y. |
| June | 1966—**53rd AES Annual Convention,** Hotel Fontainebleau, Miami, Florida. Dixie Regional Council, Sponsor. Southeastern Branch, Host. |

## INTERSOCIETY

| | |
|---|---|
| Nov. 27-Dec. 2, | 1960—**American Society of Mechanical Engineers,** Winter Annual Meeting, Statler-Hilton Hotel, New York City. |
| January 24-27, | 1961—**Society of Plastics Engineers,** 17th Annual Technical Conference, Shoreham Hotel, Washington, D. C. |
| Jan. 30-Feb. 3, | 1961—**American Society for Testing Materials,** Committee Week, Netherland-Hilton Hotel, Cincinnati, Ohio. |
| March 20-24, | 1961—**12th Western Metal Congress and Exposition,** Pan-Pacific Auditorium, Los Angeles, Calif. |


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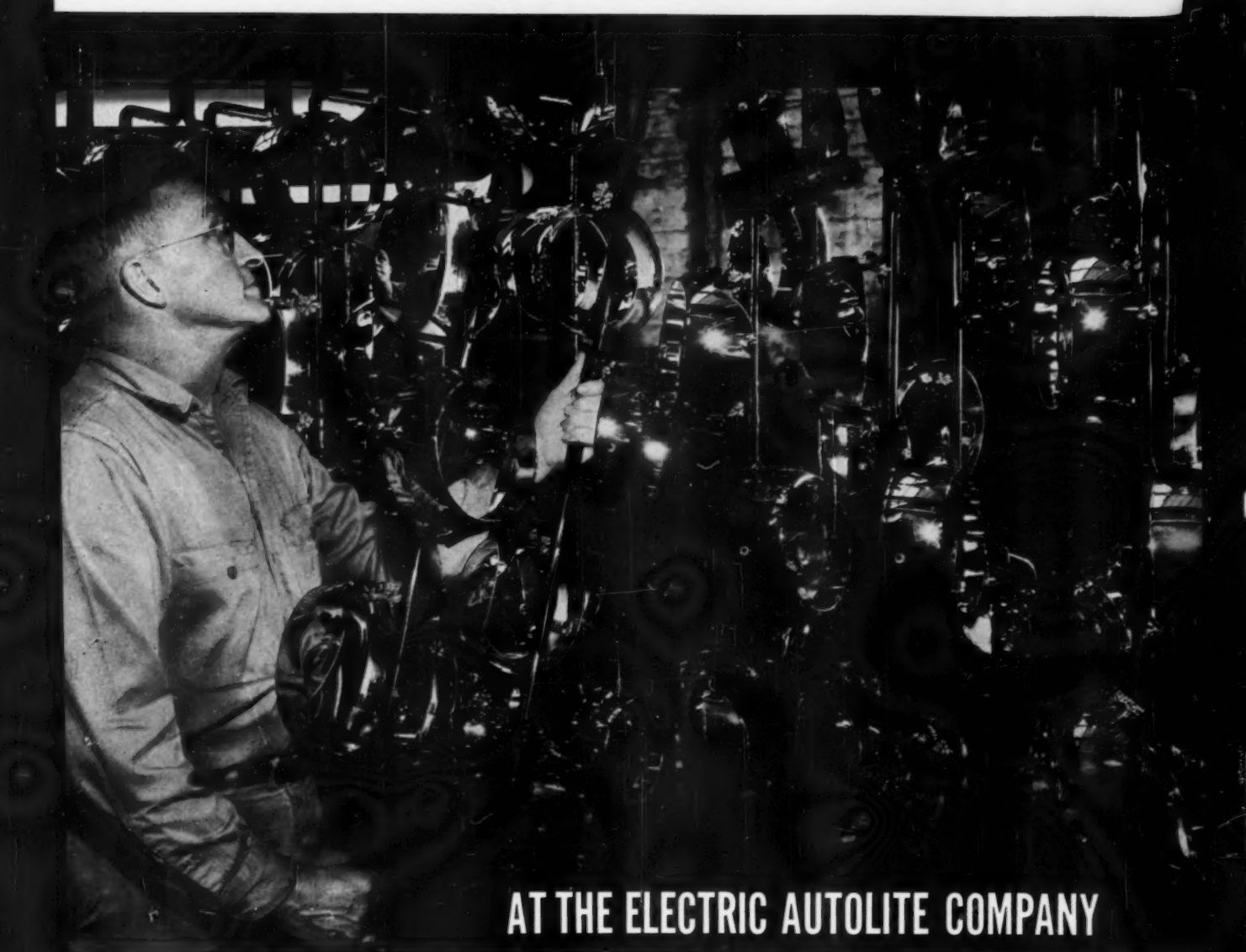


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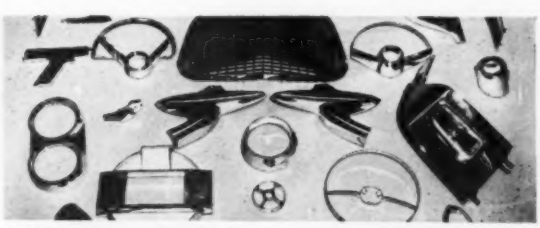

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